DASH II

OPERATION MANUAL

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DASH II

OPERATION MANUAL

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Recorder Identification Data

Congratulations. Your Astro-Med purchase is an investment in the finest state-of-the-art recorder technology. The information provided below lists the model number, serial number, and software version of your recorder.

The original software version number represents the software originally installed in your recorder. Any upgrades of the recorder's resident software should be noted in the space provided. If, for any reason, it should be necessary for you to contact Astro-Med regarding your purchase, please refer to the following:

Model Number:_____

Serial Number:_____

Software Version:_____
(original installation)

Upgraded Software Version:_____
(date installed: ___/___/___)

Upgraded Software Version:_____
(date installed: ___/___/___)

Upgraded Software Version:_____
(date installed: ___/___/___)

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1 INTRODUCTION

The DASH II is a two-channel portable recorder that can operate using AC power, DC power, or internal battery. With cast-aluminum chassis, compact size, and advanced signal processing, the DASH II is ideal for a wide range of field or laboratory applications.

With integrated general-use voltage amplifier and internal digital signal processing, each channel can be configured for voltage input or DC-bridge circuit input. Selectable DC bridge excitation is generated internally for each channel.

USER INTERFACE

The front-panel display is the principal avenue of communication from the DASH II to you. Straightforward and self-explanatory menus guide you through the DASH II functions. Four soft keys below the display allow you to navigate and execute the menu functions. The meaning of each soft key changes as the menu function changes. The current soft key function is identified by the label on the display above it.

The fixed keys on the front-panel either execute a direct function or access the menus for a particular function. The encoder wheel is used in conjunction with the menus to expand the range of possible values for a given function. Fields that require use of the encoder wheel blink when activated.

A single 3.5-inch, 1.4-Mb disk drive can be used to store and recall multiple system setups or data capture records. File formats are IBM-PC-compatible and are consistent with other Astro-Med products, thereby allowing you to use file conversion software to process captured data for export to analysis software.

ADDITIONAL FRONT-PANEL INDICATORS

Several LEDs augment the front-panel display to indicate system status and facilitate operation of the DASH II:

- An Arm LED illuminates to indicate when the DASH II is armed for data capture.

- A Trigger LED illuminates when a valid system trigger occurs, either when meeting trigger criteria that you established or when you press the **TRIG** key on the DASH II.

- A Power Status LED indicates the battery status. The LED illuminates green when the main power battery is fully charged or is being charged under external AD/DC power input. The LED illuminates red when the main power battery voltage is low, and does not illuminate when the main power battery is in its normal operational range.

- Each channel has a dedicated LED, which illuminates only if its input is DC bridge.

FEATURES & BENEFITS

This extraordinary recorder offers the following advantages:

EASY-ACCESS FRONT-PANEL CONTROLS

- Every significant recorder function is readily accessed using the simple, straightforward, front-panel controls.
- Controls include the menu key, speed selection keys, channel setup keys, encoder wheel, and much more.

TWO FLEXIBLE-FORMAT RECORDING CHANNELS

- Waveforms can be recorded on two separate adjacent channels or on one overlapped channel.
- Grid sizes are 40mm or 50mm for separate channels or 100mm for overlapped channels.
- Output of a precision voltage reference is used to ensure exactly calibrated charts.

- Four types of alphanumeric annotation are available:
  - two 128-character channel annotation buffers
  - one system log buffer that prints the time, date, chart speed, and time mark setting, as well as any user-entered information.
  - signal conditioner reporting, which prints the gain settings for each waveform channel in the last 32 character spaces of the channel annotation buffers
  - channel identification numbers over-printed on waveforms when the front-panel **ID** key is pressed
- Vertical grid lines can be synchronized to the timing marks, making the entire grid a time line for easier waveform analysis.
- Event marker can be manually activated with the front-panel **EVENT** key, or with external input to the EXT EVENT jack.
- Tri-level timing marks can be printed on the chart's right edge, left edge, or both.

DIGITAL SIGNAL PROCESSING (DSP)

- A dedicated digital signal processing circuit (DSP) and an analog-to-digital converter (ADC) support both channels.

- The DSP processes the ADC output for printing or data-capture memory.

- The DSP provides the following filter options:

  - low-pass filtering from 1 to 500 Hertz
  - 50- or 60-Hertz notch filters
  - RMS (mean) filter

DATA-CAPTURE AND PLAYBACK

- Up to 256 kilosamples of data can be captured per channel, at sample rates from 60 seconds to 100 μseconds (10 kHz).

- Data can be captured in records of 1 to 256 kilosamples per channel.

- Records can be stacked to a total of 256 kilosamples per channel or 100 records.

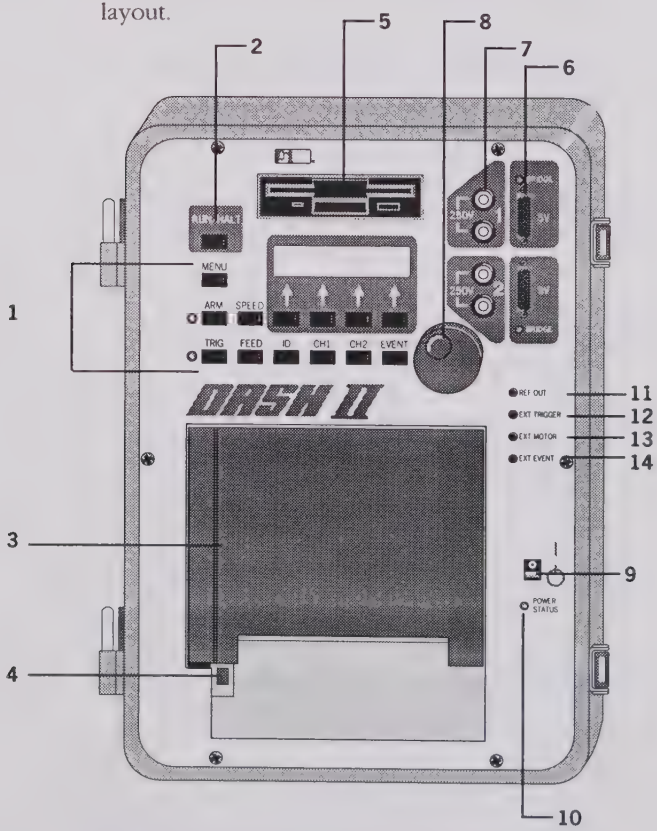
- Captured data can be archived to floppy drive for nonvolatile storage.

DOS-COMPATIBLE DISK DRIVE

- The standard 3.5", 1.4 MByte DOS-compatible disk drive is used for nonvolatile storage of system setups or captured data, and for system software upgrades.

HARDWARE ORIENTATION

The following illustration and labels provide a quick reference to the DASH II's controls and layout.



1 CONTROL KEYS:

- **MENU** KEY
- **ARM** KEY
- **TRIG** KEY
- **SPEED** KEY
- **FEED** KEY
- **ID** KEY
- **CH1** KEY
- **CH2** KEY
- **EVENT** KEY
- FUNCTION-SPECIFIC SOFT KEYS (BELOW DISPLAY)

2 **RUN/HALT** KEY

3 PAPER-CHAMBER DOOR

4 PAPER-CHAMBER DOOR RELEASE

5 DISK DRIVE

6 BRIDGE INPUT CONNECTIONS

7 VOLTAGE INPUT CONNECTIONS

8 ENCODER WHEEL

9 POWER SWITCH

10 POWER STATUS INDICATOR

11 CALIBRATION REFERENCE

12 TRIGGER IN/OUT

13 EXTERNAL MOTOR SOURCE

14 EXTERNAL EVENT IN

GETTING STARTED

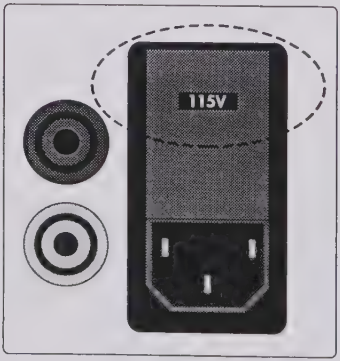
Begin exploring your new recorder by setting up the DASH II and choosing an operating speed.

SETTING UP THE DASH II

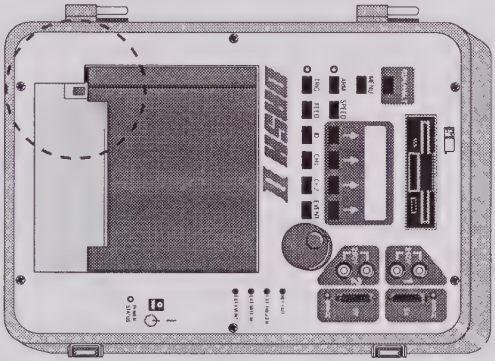
1 Unpack your DASH II and verify that it has not been visibly damaged during shipment.

VOLTAGE VERIFICATION

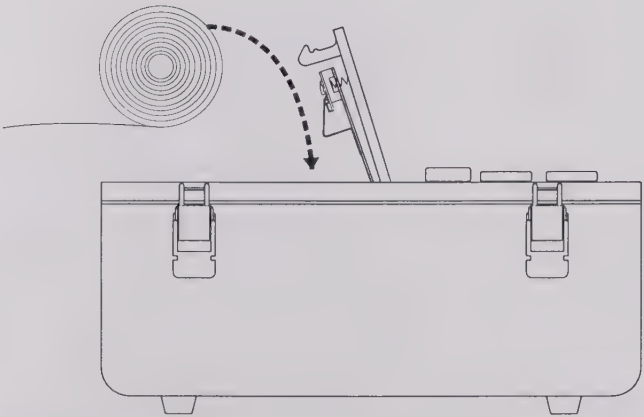
2 Examine the rear panel and verify through the window on the fuse block that the voltage selection cylinder is set to the line voltage that you are using.



3 Open the DASH II case and press the paper-chamber door release to open the door.



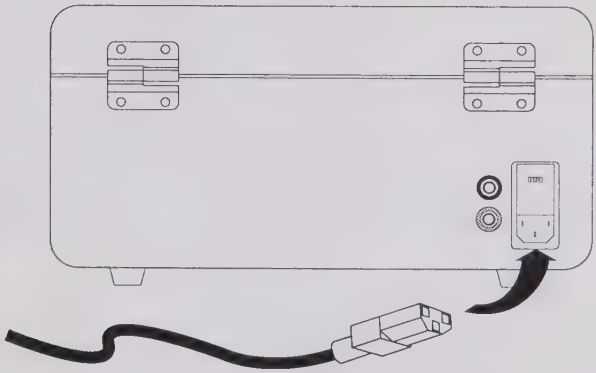
4 Place a roll of thermal paper into the paper chamber, ensuring that the thermal paper is inserted so that it unwinds from the bottom of the roll. Allow a few inches of paper to extend out of the chamber.



5 Close the paper-chamber door.

POWER UP UNIT

6 Connect the DASH II's AC power cord to the power receptacle on the rear of the recorder's case.



7 With the DASH II turned off, plug the AC power cord into a power outlet.

SIGNALS IN

8 Connect one or more signal sources to the front-panel signal-input connectors.

NOTE: Signal input cables are not supplied with the DASH II. You must supply the cables. Each input type uses a separate connector: an isolated DC-coupled voltage input uses a pair of guarded banana inputs; a non-isolated DC bridge input uses a multi-signal terminal block.

TURN ON DASH II

When you turn on the DASH II, the display will illuminate and read "DASH II Initialization." When the recorder is initialized and ready for operation, the display will show the Real-Time menu, which will flash the following information: the state of the recorder (idle, active, or halted), time, date, chart type, and chart speed.

You can begin using your recorder after establishing some of the basic setup parameters, including:

- general recorder setup, including setting a chart speed
- selecting a chart format
- defining how incoming signals are handled
- choosing a mode of operation

Establishing system parameters (the system setup) and operating the DASH II is described in the remaining chapters of this manual.

When the DASH II is turned off, or in the event of a power loss, the current system setup is saved. Previous operation is also automatically restored with the exception of an active data capture or playback operation.

START RECORDING

Press the **RUN/HALT** key — the DASH II will begin recording. You can control running of the chart with the following front-panel soft keys:

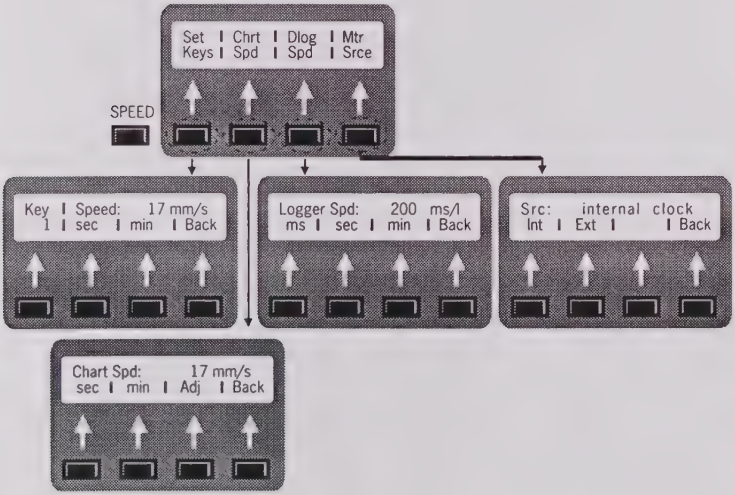
RUN/HALT Experiment stopping and starting the chart by pressing the **RUN/HALT** key.

FEED Pressing the **FEED** key causes the chart to advance when the recorder is in the halted state. The chart will continue to advance as long the the **FEED** key is held down.

SPEED KEYS Speeds can be set easily by pressing the **SPEED** key, followed by the appropriate soft key below the chart speed you wish to use.

Setting Recording Speeds

The Speed/Clock Setup menu allows you to set four real-time recording speeds of your choice, as well as a chart speed for data logging. In addition, you use this menu to set the source of the chart motor clock.


Set Keys | Chrt Spd | Dlog Spd | Mtr Srce
SPEED
Key 1 | Speed: 17 mm/s sec | min | Back
Logger Spd: 200 ms/l ms | sec | min | Back
Src: internal clock Int | Ext | | Back
Chart Spd: 17 mm/s sec | min | Adj | Back

SETTING REAL-TIME RECORDING CHART SPEEDS

To set the four real-time recording speeds to be associated with the four soft keys:

1 Press and hold the **SPEED** key until the Speed/Clock Setup menu appears.

2 Press the soft key below Set Keys.

3 Press the first soft key to select the key for which you are choosing a speed.

4 Press the soft key below sec to set millimeters per second or below min to set millimeters per minute.

5 Use the encoder wheel to choose a value from 1 to 200.

6 Repeat steps 3 through 5 for each key for which you wish to set a recording speed.

7 Press the soft key below Back to return to the Speed/Clock Setup menu.

If you wish to change the chart speed without setting one of the four soft keys:

1 Press the soft key below Chrt Spd.

2 Press the soft key below sec to set millimeters per second or below min to set millimeters per minute.

3 Use the encoder wheel to choose a value from 1 to 200.

4 Press the soft key below Back to return to the Speed/Clock Setup menu.

FINETUNING CHART SPEED

If, for any reason, you wish to adjust the chart speeds, the DASH II allows for correction in the range of +2% to -2%. This correction applies to the timing of the motor clock, and will therefore affect all speed selections until you choose to adjust the speed again. To adjust chart speed:

1 Press the soft key below Chrt Spd.

2 Press the soft key below Adj.

3 Use the encoder wheel to choose a value from +2% to -2%, in .1% increments.

You may need to experiment with the settings to attain the degree of precision required.

4 Press the soft key below Back to return to the Speed/Clock Setup menu.

SETTING DATA LOGGER SPEED

In the Data Logger Mode, speed is determined in a different manner than in other modes. In other modes, speed is determined as millimeters of print per unit of time. When in data logger format, speed is determined as a line of data printed during a particular span of time. Data logging speed can be specified as a line of data printed every so many milliseconds, seconds, or minutes, up to a maximum speed of one line every 200 milliseconds.

To set a speed for data logging:

1 Press the soft key below Dlog Spd.

2 Press the soft key below ms to select lines per millisecond, sec to select lines per second, or min to select lines per minute.

3 Use the encoder wheel to choose a value:

for milliseconds	(200-999)
for seconds	(1-999)
for minutes	(1-999)

4 Press the soft key below Back to return to the Speed/Clock Setup menu.

SETTING THE MOTOR CLOCK SOURCE

Motor speed can be controlled either by the DASH II's internal clock or by an external clock. External sources allow control of the motor speed via an external frequency, which is input to the DASH II at the EXT MOTOR jack on the recorder's front panel.

To set the source of the motor clock:

1 Press the soft key below Mtr Srce.

2 Press the soft key below Int to choose the internal clock or below Ext to specify an external source.

Make sure that if Ext is indicated, a clock source is connected to the DASH II at the EXT MOTOR jack.

3 Press the soft key below Back to return to the Speed/Clock Setup menu.

EXT MOTOR JACK The external motor input is a TTL-level input that can be used in one of two ways:

EXTERNAL

When Ext is chosen as the motor clock source, the EXT MOTOR jack accepts a signal to be used as a motor clock source. Resolution is 12 steps per millimeter of chart paper movement and the maximum chart speed is 25 millimeters per second, at a maximum of 300 Hertz.

The DASH II's internal speed settings are not relevant or functional.

INTERNAL

When Int is chosen as the motor clock source, the EXT MOTOR jack can accept a signal to be used as a remote stop/start. As you would expect, the remote stop/start function allows you to stop and start the chart drive without using the front-panel controls. As an external motor start/stop input, the CPU stops the motor if the signal is polled high (its default condition) and starts the motor when asserted low by an external device.

Refer to Appendix C for more information on using the external input/output jacks.

2 CHART & GRID SETUP

Chart setup parameters control the representation of data on the chart. When modifying these parameters, you are changing the chart format that is currently running, or, if the unit is in the idle state, of the last chart to run.

The DASH II allows you to choose one of three different grid layouts, turn channel grids on or off, or turn minor grid divisions on or off. You are also able to suppress or enable the printing of waveforms, as well as vary the waveform trace thickness.

Like all system setup commands, the chart setup commands can be executed at any time — while the recorder is in the idle state or in operation. However, maximum efficiency is achieved when setup is done while the recorder is idle.

All system parameters are saved in non-volatile memory, and are thus remembered when the recorder is powered down and then powered on again. They can also be saved to disk in the DASH II disk drive as a complete system setup.

Setting Up a Grid

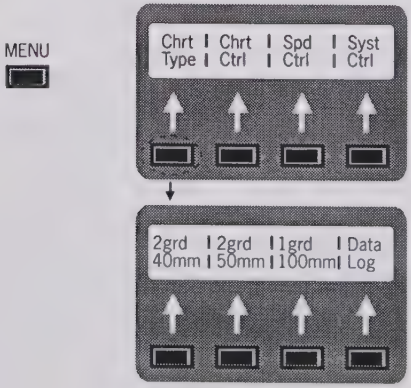
The DASH II allows you to choose one of the following three grids:

- two 40-mm grids, one for each channel
- two 50-mm grids, one for each channel
- one 100-mm grid, with two channels overlapped

To choose the grid you want to use:

1 Press the **MENU** key.

2 Press the soft key below Chrt Type. The Change Grid menu will appear:



3 Press the soft key below the grid you wish to use, or press Data Log to print numerical data.

In addition to the grid, you will set the following chart parameters:

- turn the grids completely on or off
- turn the minor grid divisions on or off
- choose whether to print timing marks, and if so, choose the location and the time interval
- choose whether to synchronize the grids with timing marks
- select the style of event marker you wish to use
- turn waveforms on or off
- set the thickness of the waveforms

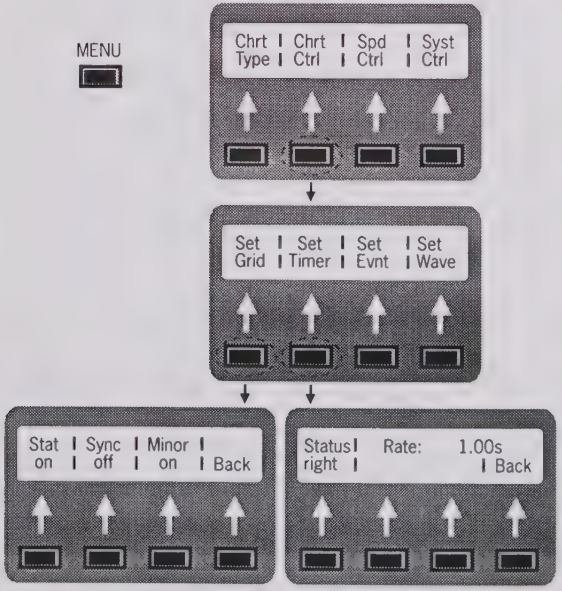
GRIDS AND TIMING MARKS

The Set Grid menu allows you to turn the grid(s) on or off, turn the grid's minor divisions on or off, and specify whether you want the grid lines syncronized with the timing marks. The Set Timer menu allows you to turn the timing marks on and off, to specify where the timing marks will be printed (the chart's left edge, right edge, or both edges), and to select the time interval between each timing mark tick.

To set the chart parameters:

1 Press the **MENU** key.

2 Press the soft key below Chrt Crtl. The Chart Control menu will appear:



3 Press the soft key below Set Grid to set the following choices:

- Press the soft key below Stat to turn the grids completely on or off.

- Press the soft key below Sync to turn grid synchronization with the timing marks on or off.

- Press the soft key below Minor to turn the minor grid divisions on or off.

4 Press the soft key below Back to return to the Chart Control menu.

5 Press the soft key below Set Timer to access the menu where you can choose the location and the time interval of timing marks:

- Press the soft key below Status to select a location for the timing marks — the right side of the chart, the left side, or both — or to turn the timing marks off.

- Turn the encoder wheel to select the time interval at which the timing marks will print. Choices range from .01 to 60 seconds.

6 Press the soft key below Back to return to the Chart Control menu.

EVENT MARKERS

The DASH II is equipped with a system event marker, which is printed beneath the system log at the top (left side) of the chart. You can mark data of interest with the system event marker by pressing the front-panel **EVENT** key, which will cause the system event marker to deflect to the left to mark the location of data of interest. The system event marker will return to its undeflected position when the **EVENT** key is released.

In addition, there is a jack for an external event. Generally, an event marker indicates a change in the state of signal input.

NOTE: Don't confuse the system event marker, which responds when the **EVENT** key is pressed, with the external event marker controlled through signals input through the EXT EVENT phone jack.

One of four event marker styles can be chosen. The selected style globally applies to both types of event markers.

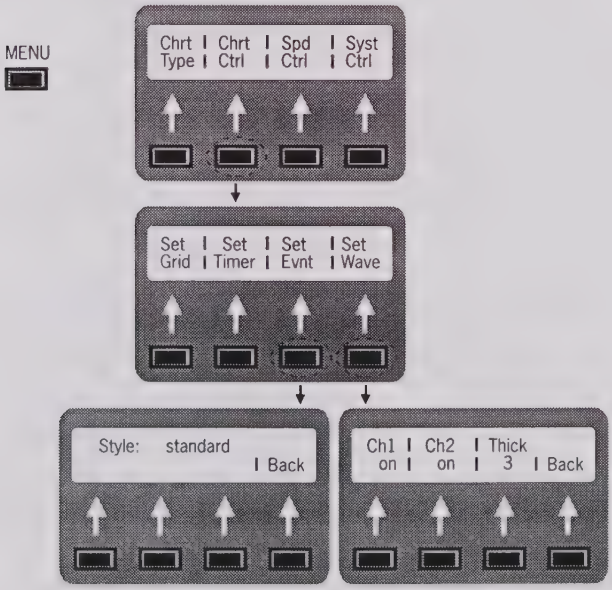
WAVEFORMS

Signal setup is described in the next chapter. This section describes simply how the waveforms will appear on the chart. You can turn waveform printing on or off and set the thickness of the waveform trace.

To set the chart parameters for event markers and waveforms:

1 Press the **MENU** key.

2 Press the soft key below Chrt Crtl. The Chart Control menu will appear:



3 Press the soft key below Set Evnt to access the menu where you can choose the style of event marker you wish to use. Use the encoder wheel to select one of the following styles:

4 Press the soft key below Back to return to the Chart Control menu.

5 Press the soft key below Set Wave to turn waveforms on or off and to select the line thickness of the waveform:

- Press the soft key below Ch1 to turn the waveform for channel 1 on or off.
- Press the soft key below Ch2 to turn the waveform for channel 2 on or off.
- Press the soft key below Thick as necessary to select a waveform line thickness level from 1 to 5.

6 Press the soft key below Back to return to the Chart Control menu.

TEXT ANNOTATION

The DASH II chart recording includes three types of alphanumeric annotation:

- two 4-character channel ID buffers
- two 128-character channel annotation buffers
- one system log buffer

CHANNEL ID BUFFERS

Each channel is labelled with its channel number whenever the **ID** key is pressed. As the name implies, channel ID numbers clearly indicate the number of the waveform channel. Channel identification numbers are overprinted directly on the waveforms.

Channel identification numbers provide a simple way of quickly locating each waveform channel on the chart. This is especially useful when waveforms overlap during recording.

CHANNEL ANNOTATION BUFFERS

Two 128-character buffers provide descriptive information on each channel, including each channel's signal condition. The annotation buffers are synchronized with one another and are printed repeatedly and continuously at a standard distance on the chart.

Each buffer contains an area identifying the channel with labels "Channel #1" and "Channel #2." You can edit these label areas if you wish by following the same procedure as described for the system log in the following section.

SYSTEM LOG

One line, printed at the top of the chart, continually provides the time, date, chart speed, and time mark setting, and informs you of the current mode of operation. Up to 28 characters can be used for user-defined comments.

To enter text into the last 28 characters of the system log buffer, you must use a text editor to open and edit a saved system setup file.

1 If you wish to use your current setup, place a diskette in the DASH II disk drive and save the system setup to diskette as described in Chapter 5.

2 Access the file from diskette with a text editing program on your PC.

NOTE

It is recommended that you make a copy of the system setup file before altering it, in case the file becomes corrupted during editing.

3 * In the file, you will notice sections entitled, [Chart 1 Settings] and [Chart 2 Settings]. Each section will have a line entitled "Chart # - System Log." Move your cursor to these lines.

4 * For each chart, in the space available to the right of the equal sign, type in any text that you wish to see printed in the user-defined area of the system log.

5 Save the file and place the diskette containing the file back into the DASH II's disk drive.

6 Restore the system setup from the disk as described in Chapter 5 to make the setup with the edited text lines the active system setup.

* If you are editing the channel annotation labels, you would move to the lines entitled "Chart # - Text 1" and "Chart # - Text 2."

For each chart, in the space available to the right of the equal sign, edit the text to print what you would like in the label areas of the channel annotation buffers.

WARNING Editing other areas of a system setup file could have a serious impact on your system operation. Do so only if necessary and with considerable caution.

3 Channel & Signal Setup

The Channel Setup keys are used to set parameters that determine how incoming signals are handled by the DASH II. For each channel, channel setup involves:

- selecting a voltage sensitivity for a channel
- selecting a location for the zero baseline of the signal
- suppressing up to ±500 mV DC of the waveform input
- specifying whether the signal will be DC input, bridge input, or grounded
- selecting filters
- calibrating each channel

SIGNAL INPUT

Each of the two channels can be configured for one of two types of signal input — isolated DC-coupled voltage input or non-isolated DC bridge input.

Each input type uses a separate connector. An isolated DC-coupled voltage input uses a pair of guarded banana inputs. A non-isolated DC bridge input uses a multi-signal terminal block. A dedicated LED indicator, labeled "BRIDGE," illuminates when DC bridge input is active.

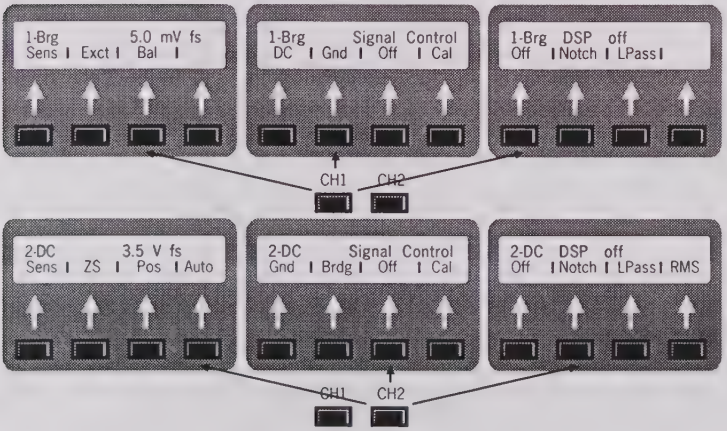
ISOLATED DC SIGNAL INPUT

The isolated DC signal input can be in the ±250 V RMS range, or input can be "grounded" to disconnect the isolated signal(+) input and connect the isolated signal(-) input. Grounding the signal is useful during calibration and while positioning the baseline of the signal input.

NON-ISOLATED DC BRIDGE INPUT

The non-isolated bridge circuitry allows resistance bridges to be used for signal inputs. When a proper transducer is connected externally, DC bridge input can be used to measure temperature, force, or other such values. The circuit includes an adjustable voltage output for bridge excitation.

The Channel Setup Keys (**CH1** or **CH2**) below the front-panel display access the Channel Setup menus for that channel. There are three levels of channel setup, each of which can be accessed by rotating through them with the **CH1** or **CH2** key.


1-Brg 5.0 mV fs
Sens | Exct | Bal |
1-Brg Signal Control
DC | Gnd | Off | Cal
1-Brg DSP off
Off | Notch | LPass |
CH1
CH2
2-DC 3.5 V fs
Sens | ZS | Pos | Auto
2-DC Signal Control
Gnd | Brdg | Off | Cal
2-DC DSP off
Off | Notch | LPass | RMS
CH1
CH2

DC INPUT/DC BRIDGE INPUT/GROUND

1 Press **CH1** or **CH2** twice (or as necessary) to access the center display in the illustrations.

2 Press one of the available soft keys if you wish to change the input signal or ground the signal.

3 Press the third soft key to turn the channel trace (waveform) on or off.

When you press one of the channel setup keys, the current setup for signal input will be displayed in the upper left corner.

4 Press **CH1** or **CH2** as necessary to access the first setup menu in the prior illustrations.

Depending on whether the signal is DC input or bridge input, you will see one of the first displays in the above illustrations, which sets the soft keys to allow you to set signal parameters as follows:

DC INPUT	**BRIDGE INPUT**
SENSITIVITY	SENSITIVITY
ZERO SUPPRESSION	EXCITATION
POSITION	BALANCE
AUTO-RANGE	

SENSITIVITY

Since signal size is independent of grid size, adjusting channel sensitivity allows for a finer or coarser view of the signal data to be obtained.

5 To set the signal sensitivity, press the first soft key below Sens.

6 Turn the encoder wheel to select a full-scale voltage range up to 50 mV to 350 volts for DC input, or up to 5 mV to 300 mV for Bridge input.

isolated DC input only

AUTO-RANGE

For an isolated DC input channel, the DASH II will select the closest full-scale input range and zero position for each channel.

7 To activate the auto-range capability, press the soft key below Auto.

isolated DC input only

ZERO SUPPRESSION

Some isolated DC input signals may contain an unwanted DC component, which may make it difficult to bring the waveform data of interest onto the chart.

Zero suppression can be used to remove from -250 to +250 V of a waveform's DC component and to bring the data of interest onto the chart for recording and analysis.

If you wish to suppress a positive voltage, specify a negative zero suppression value; if you wish to suppress a negative voltage, specify a positive zero suppression value.

For an isolated DC input channel:

8 Press the soft key below ZS.

9 Turn the encoder wheel to select the amount to be suppressed.

To quickly reset the balance to 0.00, you can press the soft key below 0 V.

non-isolated DC bridge only

BALANCE

If the channel Input is DC bridge input, the DASH II will perform an auto-balance on the selected channel. You must select the baseline (center, left edge, or right edge of grid) on which to position the signal.

For a channel with non-isolated DC bridge input:

10 Press the soft key below BAL.

11 Turn the encoder wheel to select either the left, center, or right position.

non-isolated DC bridge only

EXCITATION

The bridge input circuit includes an adjustable voltage output for bridge excitation. To set a voltage level for bridge excitation:

12 Press the soft key below Exct.

13 Turn the encoder wheel to select a voltage value from 0 to 10 volts, in .25-volt increments.

To quickly reset the excitation to 0.00, you can press the soft key below 0 V.

isolated DC input only

POSITION

This parameter enables the zero baseline to be positioned. You select a chart location for the zero baseline of the waveform with reference to the center of the grid.

You may find it useful to ground the signal by pressing the soft key above "DC/GND." This will provide a flat zero-baseline that is easily positioned on the chart.

14 Press the soft key below Pos.

15 Turn the encoder wheel to select a position for the zero baseline. The position that you specify is the distance from the center of the grid.

When the encoder wheel is rotated to the right, the zero baseline shifts toward the top edge of the chart.

When the encoder wheel is rotated to the left, the zero baseline shifts toward the bottom edge of the chart.

Signal setup also involves selecting a filter for an incoming signal or turning all filtering off.

16 To continue setting up signals, press **CH1** or **CH2** again to access the third display in the prior illustrations, which will allow you to establish signal filtering criteria.

17 Press the soft key below Notch and use the encoder wheel to select either the 50Hz or 60Hz filter:

notch (50Hz)	Filters the 50Hz frequency component out of the input signal.
notch (60Hz)	Filters the 60Hz frequency component out of the input signal.

18 Press the soft key below LPass to select a low-pass filter. Use the encoder wheel to select a cutoff frequency between 1Hz and 500Hz.

isolated DC input only

19 Press the soft key below RMS to perform a root-mean-square operation on a DC voltage input signal. Use the encoder wheel to choose either a fast, medium, or slow setting for the operation.

A faster setting will produce a quicker response to change in the signal, but may also produce a ripple in the waveform. If you notice a ripple effect that you consider excessive, choose a slower setting.

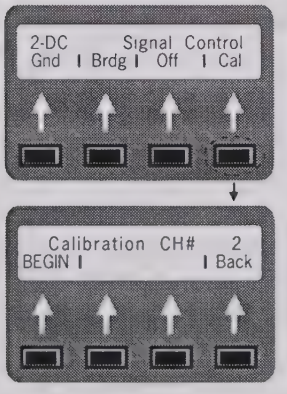
For the purpose of system calibration, the DASH II is equipped with extremely precise internal voltage references. The DASH II automatically grounds the signal, selects the calibration voltage, and controls the signal input amplifier range.

Use the following procedure to calibrate each channel:

1 Locate the cable (provided with your DASH II) with a 2-plug banana jack on one end and a subminiature phone jack on the other end.

2 Run the cable from the REF OUT phone jack on the front of the DASH II to the signal inputs of either channel.

3 To continue setting up signals, press **CH1** or **CH2** until the following menu appears:



4 Press the soft key below Cal to access the Calibration menu.

5 Press the soft key below BEGIN to start the calibration process, which will cause the following to occur:

   1) The selected channel is grounded.

   2) The precise reference voltage is input.

   3) Internal adjustments are automatically made as necessary to exactly maintain the original signal setup.

6 Press the soft key below Back to leave the System Calibration menu.

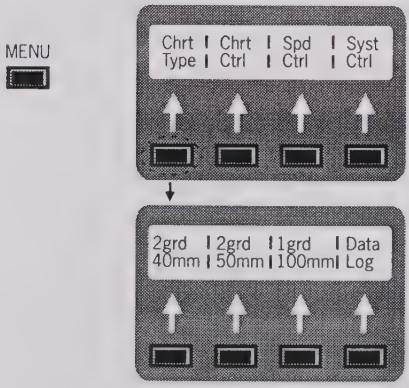
7 Repeat the calibration process if you wish to calibrate the other channel.

REAL-TIME RECORDING

The DASH II offers two real-time modes:

REAL-TIME RECORDING	The DASH II records the analog signals as established by the signal setup described in this chapter.
DATA LOGGING	The DASH II prints out real-time data in numerical format.

To select either analog waveform recording or digital recording, press the front-panel **MENU** key:



1 Press the soft key below Chrt Type to choose one of the grid formats for analog signal recording or to choose data logging.

2 To begin chart recording, press the **RUN/HALT** key.

The DASH II will begin recording. Waveforms will be printed if a real-time grid format was selected; digital data will be printed if data logging was selected.

3 Use the **RUN/HALT** key to control running of the chart.

While recording, you can use the **SPEED** key to access the Speed menu and choose a different chart speed.

4 Data Capture & Playback

Data capture refers to the acquisition and storage of real-time waveform data. Since the data being captured is the real-time waveform data, data capture occurs under the parameters established for real-time recording at the time of the capture.

The DASH II has the capability to capture and replay 256 kilosamples of data per channel, in record sizes from 1 to 256 kilosamples per channel. In order to complete a data capture, you must perform the following steps:

1 Set Up Data Capture

2 Arm The System
To begin data capture, the system must be armed. The system can be armed manually or automatically. The system is armed when the Arm LED indicator light next to the **ARM** key is illuminated.

3 Initiate Data Capture
Once armed for data capture, the DASH II stores data so that it can begin data capture immediately upon meeting trigger criteria.

4 Determine Use of Captured Data
Captured data can be stored and played back as you wish.

NOTE

When capturing data, it is important to keep in mind that data-capture memory is volatile. If you want to retain the data, it is essential to store data-capture records to nonvolatile media such as disks (described in Chapter 5). If captured data is not stored to nonvolatile media, the data will be lost if power to the recorder is interrupted or if the recorder is powered down.

TRIGGER SETUP

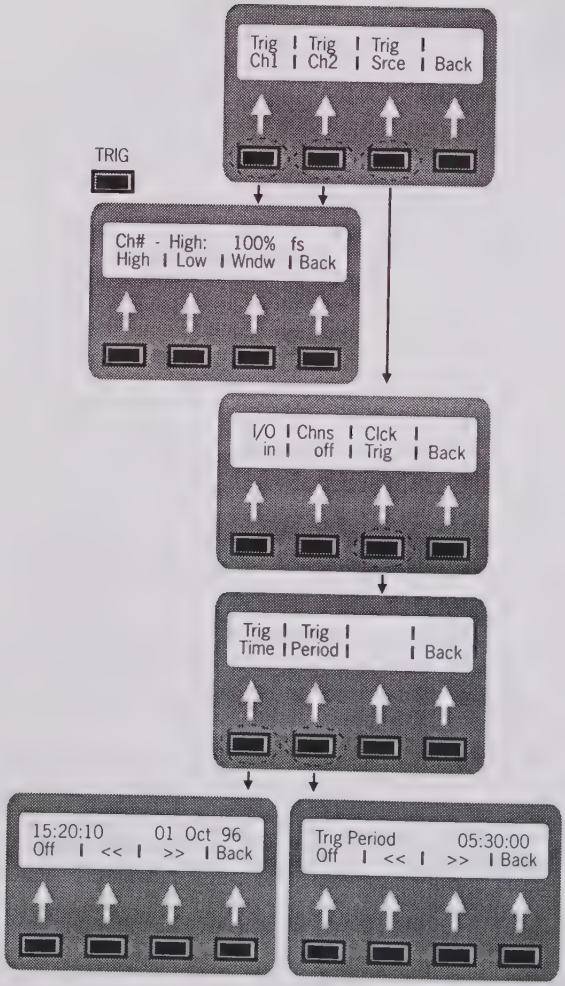
A trigger generally acts as a cue for the DASH II to create a data capture record. Depending on how you set up trigger conditions, the captured data can be pre- or post-trigger. The Setup Trigger parameters are used to:

- turn trigger sources on or off
- define AND/OR relationships for the trigger
- define voltage levels over which and below which the input signal will cause a trigger condition.

ESTABLISHING TRIGGER SOURCES

The trigger can be generated in several ways:

MANUAL	Triggers are generated when the front-panel **TRIG** key is pressed.
WAVE	Triggers occur when a signal exceeds or falls below user-defined trigger limits.
EXTERNAL	Triggers are communicated through the EXT TRIGGER phone jack on the front panel.


Trig | Trig | Trig |
Ch1 | Ch2 | Srce | Back
TRIG
Ch# - High: 100% fs
High | Low | Wndw | Back
I/O | Chns | Clck |
in | off | Trig | Back
Trig | Trig |
Time | Period | | Back
15:20:10 01 Oct 96
Off | << | >> | Back
Trig Period 05:30:00
Off | << | >> | Back

To establish trigger sources and criteria:

1 Hold down the **TRIG** key until the Trigger Setup menu appears.

From this menu, you define AND/OR relationships between signals, as well as the voltage levels at which an input signal will cause a trigger.

2 First, press the soft key below Trig Srce to access the menu where you indicate the source of the trigger.

3 Press the soft key below Chns to establish the sources of waveform triggers, or to turn all waveform triggering off. Your options are:

off	turns all waveform triggering off
ch1	establishes channel 1 signal input as a trigger source
ch2	establishes channel 2 signal input as a trigger source
Chns 1 or 2	establishes both channels as trigger sources, related in an OR combination
Chns 1 and 2	establishes both channels as trigger sources, related in an AND combination

An OR trigger group allows you to combine both trigger sources so that a valid trigger in either source generates a trigger.

An AND trigger group allows you to combine waveform trigger sources so that a trigger is generated when valid trigger conditions are detected at the same time in both waveforms.

4 Press the soft key below I/O to specify whether the EXT TRIGGER jack will function as trigger input or output.

Selecting in allows other instruments and devices to trigger a DASH II data capture; selecting out allows the DASH II to trigger other instruments. Refer to Appendix C for more information about external input to the DASH II.

5 Press the soft key below Clck Trig to access the menu that allows you to set either:

- a periodic trigger, which is generated automatically and continuously at specified time intervals, or
- a clock trigger, which is generated automatically at a specific date and time

6 To set a periodic trigger or to turn periodic triggering off, press the soft key below Trig Period.

7 If periodic triggering is on and you wish to turn it off, press the soft key below Off.

8 If periodic triggering is off and you wish to turn it on, press the soft key below On to turn periodic triggering on. Use the arrow keys to activate hours, minutes, or seconds, then use the encoder wheel to set the time period.

9 Press the soft key below Back to return to the previous menu.

10 To set a clock trigger or to turn clock triggering off, press the soft key below Trig Time.

11 If clock triggering is on and you wish to turn it off, press the soft key below Off.

12 If clock triggering is off and you wish to turn it on, press the soft key below On to turn clock triggering on. Use the arrow keys to activate hours, minutes, and seconds, day, month, and year. Then use the encoder wheel to set the specific date and time that a trigger is to occur.

13 Press the soft key below Back twice to return up two menu-levels.

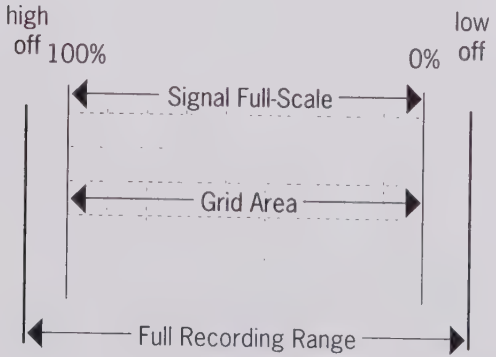
14 Again, press the soft key below Back to return to the Trigger Setup menu.

Now you can define the voltage levels for any waveform triggers.

SETTING WAVEFORM TRIGGER LEVELS

Trigger levels define the voltage levels at which a signal will create a trigger condition, when that signal is defined as a trigger source. The trigger acts as a cue for the DASH II to create a data capture record. Where the trigger occurs in the record is further defined by the trigger position, which is described in the following section.

Trigger levels are selected as 1% increments of the signal's full-scale range. Levels range from 0% (right edge of grid) to 100% (left edge of grid). If you choose to turn the high level and/or low level off, the trigger level can be outside the grid, using the full recording range.



You also choose whether a trigger will occur when the signal crosses the trigger level and is outside of the specified range or inside the specified range.

The waveform trigger itself will not become active unless a waveform trigger has been turned on for a channel. In addition, how a trigger will occur is further determined by how the channels may be related in a trigger equation. Refer to the previous section describing "And/Or Relationships."

For each trigger channel, set the trigger reference values as follows.

15 Press the soft key below Trig Ch1 or Trig Ch2. The Trigger Level Setup menu will appear.

16 Press the soft key below High and use the encoder wheel to set the upper limit for the waveform trigger, or to turn the upper limit off.

17 Press the soft key below Low and use the encoder wheel to set the lower limit for the waveform trigger, or to turn the lower limit off.

18 Press the soft key below Wndw to select either Inside to cause a trigger whenever the signal falls inside the selected range, or Outside to cause a trigger whenever the signal falls outside the selected range.

Selecting Inside is inclusive of the High and Low settings; selecting Outside is exclusive of the High and Low settings.

19 Press the soft key below Back to return to the Trigger Setup menu.

The following table provides some examples of how waveform triggers can be set up. Assuming a full-scale voltage range from -5 V to +5V:

High	*Low*	*Window*	*Trigger occurs*
off	20%	inside	when the signal is ≥ -3 V
off	30%	outside	when the signal is < -2 V
60%	0%	inside	when the signal is ≥ -5 V and ≤ +1 V
10%	off	outside	when the signal is > -4 V
100%	0%	inside	when the signal is ≥ -5 V and ≤ +5 V (full scale)
80%	20%	outside	when the signal is < -5 V or > +3 V

In order to set up a data capture, the following parameters must be defined :

- CAPTURE METHOD
  This parameter allows you to specify how you want to use the finite amount of RAM (data capture memory) within the recorder. Safe modes save data only until memory is full, thus protecting all of the data in memory. Overwrite modes overwrite the oldest files when memory is full, thereby allowing the recorder to continue capturing the latest data at the expense of older data.

  Four data capture methods are available:

  AUTOMATIC/SAFE —
  Upon arming the system with this option selected, the DASH II is automatically re-armed for another data capture upon completion of a data capture. Multiple records are captured one after another, until data capture memory is full or capture is aborted. When memory is full, no more captures can occur until records are deleted and memory is freed. Refer to Chapter 5 for information on deleting records and archiving (saving) records to diskette.

  AUTOMATIC/OVERWRITE —
  This option also causes the DASH II to be automatically re-armed upon completion of a data capture. Multiple records are captured one after another, until data capture memory is full, as in the AUTOMATIC/SAFE method.

However, at this point, subsequent captures will overwrite the oldest records in memory. Data capture is stopped only by pressing the soft key below Abort, or by turning the recorder off.

MANUAL/SAFE —
Upon arming the system, a single data capture will occur and the DASH II will not be automatically re-armed. The DASH II must be manually re-armed. Records are individually added to the inventory of records in memory, until data capture memory is full. When memory is full, no more captures can occur until records are deleted and memory is freed. Refer to Chapter 5 for information on deleting records and archiving (saving) records to diskette.

MANUAL/OVERWRITE —
Upon arming the system, a single data capture will occur and the DASH II will not be automatically re-armed. The DASH II must be manually re-armed. Records are individually added to the inventory of records in system memory, until data capture memory is full, as in the MANUAL/SAFE method. However, at this point, subsequent captures will overwrite the oldest records in memory.

- Sample Rate
  Sample rates from 100 microseconds to 60 seconds can be chosen for capturing data. In most cases, sampling data at a rate approximately 10 times faster than the highest waveform frequency provides excellent playback resolution.

- Record Size
  You can specify a record size from 1K to 256K for the next data capture. Record size indicates, in kilosamples per record per channel, the total amount of data capture memory allocated to the next data-capture record. The size applies to both channels.

  For example, selecting a record size of 64K indicates that both channels and events are being captured to a record containing 64 kilosamples for each channel.

- Trigger Position
  This parameter defines for both channels the relationship between the data-capture window and the trigger.

  The term "trigger/window relationship" describes the location of the trigger within the data-capture window. The trigger/window relationship must be defined before data is captured. After a data-capture record has been created, the trigger/window relationship cannot be changed for that record.

  Changing the location of the trigger within the window enables you to control the amount of pre-trigger and post-trigger data that is captured. For example, if you want 50% of the data that you capture to be pre-trigger data and 50% of the data to be post-trigger data, then you would set the Trigger/Window to "center."

Four trigger location possibilities are presented:

Start Triggers place the trigger at the very beginning of the window. The only data captured is after the trigger.

End Triggers place the trigger at the very end of the window. The only data captured is before the trigger.

Center Triggers place the trigger at the very middle of the window — 50% of the data captured is pre-trigger and 50% of the data is post-trigger.

Percentage Triggers place the trigger within the window at 10% increments. Pretrigger data and post-trigger data is captured with reference to where the trigger is placed.

Pre-trigger data is being captured as soon as the DASH II is armed. Upon the occurrence of a trigger, post-trigger data is captured to complete the record.

NOTE: When a sufficient amount of pre-trigger data is captured, the display reads "waiting trig." If a trigger occurs before this happens, pre-trigger capture will be interrupted and post-trigger capture will begin, thereby altering the trigger position as established.

- PLAYBACK STATUS
  If this parameter is turned on, captured data will automatically and immediately play back on the chart after a data capture is completed. Automatic playback will cause real-time recording to halt while playback is in progress.

- ARCHIVAL STATUS
  This parameter defines whether data archival will be automatic following a data capture.

  A 1.4 Mb diskette must be inserted in the DASH II disk drive in order for archival to occur. The file name is always 'D2_*xxxxx*.DCR'.

  Archival adheres to the same modes that define data capture. That is, if one of the safe modes is in effect, archival will stop when the diskette is full. If one of the overwrite modes is in effect, archival will continue with the oldest records being overwritten when the diskette becomes full.

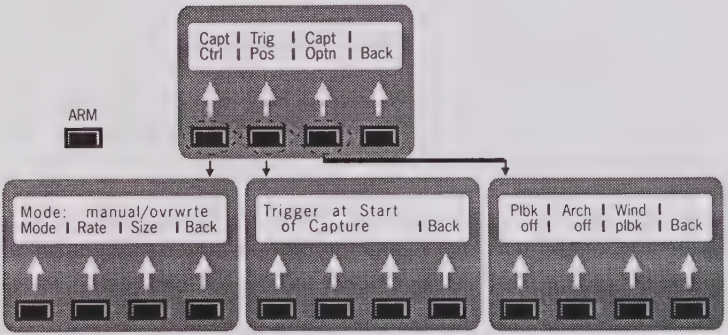
In addition to these data-capture set-up parameters, the following functions are also supported:

- RECORD FILE MANAGEMENT
  This function allows data-capture records to be deleted, saved to disk, or uploaded from disk.

An in-depth discussion of system file management is provided in Chapter 5.

To set up a capture, access the Setup Capture menu from the System Setup menu:

1 Hold down the **ARM** key until the Data Capture Setup menu appears.


Capt Ctrl | Trig Pos | Capt Optn | Back
ARM
Mode: manual/ovrwrte
Mode | Rate | Size | Back
Trigger at Start of Capture | Back
Plbk off | Arch off | Wind plbk | Back

2 Press the soft key below Capt Ctrl to set the first group of capture setup parameters.

3 Press the soft key below Mode to choose one of the following modes:

- AUTOMATIC/SAFE
- AUTOMATIC/OVERWRITE
- MANUAL/SAFE
- MANUAL/OVERWRITE

4 Press the soft key below Rate to choose a sample rate of 100 microseconds to 60 seconds.

5 Press the soft key below Size to choose a record size of 1, 4, 16, 64, or 256 kilosamples per channel.

6 Press the soft key below Back to return to the Data Capture Setup menu.

7 Press the soft key below Trig Pos to set the trigger/window relationship.

8 Use the encoder wheel to select a start, center, or end trigger, or a percentage in units of 10%.

9 Press the soft key below Capt Optn to establish whether playback and/or archival are to be automatic after data capture.

10 Press the soft key below Plbk to turn automatic playback on or off.

11 Press the soft key below Arch to turn automatic archival on or off.

12 Press the soft key below Wind to set the portion of the data capture record to be archived. Select "all" to archive the whole record; select "plbk" to archive a selected portion of the record, as specified from the Data Playback menu.

13 Press the soft key below Back to return to the Data Capture Setup menu.

As discussed earlier in this chapter, data capture can be initiated either automatically or manually, with a variety of automatic playback and/or archival options. To begin a data capture now:

1 Press the **ARM** key to arm the system.

The LED beside the **ARM** key will illumimate to indicate that the DASH II is armed for data capture. The DASH II display will read:

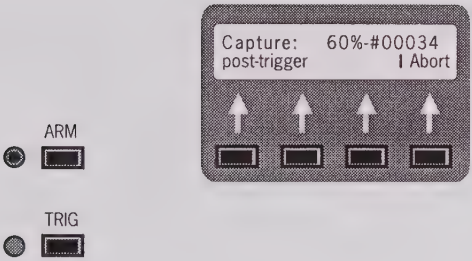
```
Capture:   0%
pre-trigger
```

If data capture has been set up to include any portion or all of the pre-trigger data, the pre-trigger data is captured immediately. When a sufficient amount of pre-trigger data is captured, the display reads "waiting trig."

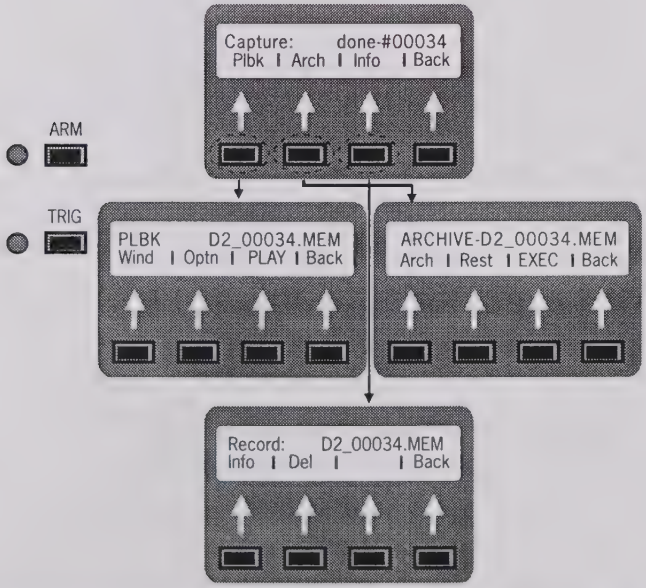
If a trigger occurs before this happens, pre-trigger capture will be interrupted and post-trigger capture will begin, thereby altering the trigger position as established.

2 Press the **TRIG** key to cause a trigger.

The LED beside the **TRIG** key will blink briefly and the DASH II display will inform you that the data capture is in progress and will display the percentage of the post-trigger capture that is completed:



You can press the soft key below **Abort** if you wish to interrupt the data capture. Otherwise, when data capture is completed, the DASH II will inform you that the capture is done and will allow you to directly access the Data Playback or Data Archival menus if you would like:



PLAY BACK DATA

If you have set up data capture with automatic playback enabled, data playback will immediately follow capture completion.

If automatic playback is not enabled, you can press the soft key below Plbk to access the Data Playback menu, where you can set up and initiate playback of the captured data.

ARCHIVE DATA

If you have set up data capture with automatic archival enabled, data will be archived to diskette (diskette must be inserted) immediately following capture completion.

If automatic archival is not enabled, you can press the soft key below Arch to access the Data Archival menu, where you can initiate archival of the captured data.

DELETE RECORD /PRINT REPORT

Pressing the soft key below Info will access a menu that allows you to delete the data capture record from system memory or to print a report about the captured data.

DATA PLAYBACK

After capturing data you will want to replay the data for examination and analysis. The DASH II provides playback controls that allow you to select for playback all the captured data in the record or any portion of the captured data that is of interest.

SETTING UP DATA PLAYBACK

Before playing back your data, you will want to specify how the data should appear. The Playback Setup parameters include:

WINDOW
selects all of the captured data or any specific portion of the data for playback.

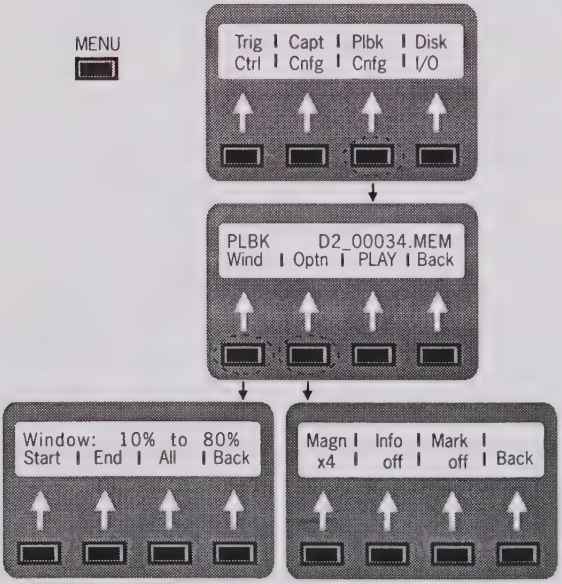
MAGNIFICATION
expands or compresses the playback to allow detailed examination of data or to obtain an overview of the data. Expansion factors range from x $1/25$ to x25.

INFO
prints the Data Capture Record Report before printing the data playback.

MARK
prints a line (mark) to delineate the trigger point of the captured record.

To set up data playback, access the Data Playback menu from the System Setup menu:

1 Press the **MENU** key twice to access the second level of system setup:


MENU
Trig | Capt | Plbk | Disk
Ctrl | Cnfg | Cnfg | I/O
PLBK D2_00034.MEM
Wind | Optn | PLAY | Back
Window: 10% to 80%
Start | End | All | Back
Magn | Info | Mark |
x4 | off | off | Back

2 Press the soft key below Plbk Cnfg to access the Playback Setup menu.

3 Press the soft key below Wind to establish the portion of the record you wish to play back.

4 Press the soft key below Start and use the encoder wheel to set the point where playback is to begin.

5 Press the soft key below End and use the encoder wheel to set the point where playback is to end.

6 If you wish to play back the entire record, press the soft key below All to reset the percentages from 0% to 100%.

7 Press the soft key below Back to return to the Data Playback menu.

8 Press the soft key below Optn to set the remaining data playback parameters.

9 Press the soft key below Magn and use the encoder wheel to establish a magnification or compression level for the data. Choices range from x $\frac{1}{25}$ to x25.

10 Press the soft key below Info to enable the printing of the Data Capture Record Report before playing out the captured data.

11 Press the soft key below Mark to enable printing of a line that delineates the trigger point in the record.

12 Press the soft key below Back to return to the Data Playback menu.

To initiate data playback, simply press the soft key below PLAY from the Data Playback menu.

You can also initiate data playback after a data capture has completed.

From the Data Capture completion display, press the soft key below Plbk to access the Data Playback menu. Then press the soft key below PLAY.

5 System Management

The procedures presented in this section describe how to define each of the DASH II system-level and diskette-based functions.

Diskette-based input/output functions include:

- saving recorder setups to diskette
- recalling saved recorder setups from diskette
- saving data capture records to diskette
- retrieving data capture records from diskette
- formatting diskettes
- deleting files from diskette
- printing files from diskette
- performing system software upgrades

System-level functions include:

- setting the system clock
- setting the DASH II to the default system settings
- system reporting
- deleting records from data capture memory

DISK-BASED INPUT/OUTPUT

Diskette-based input/output functions are done using the recorder's front-panel disk drive.

SAVING THE RECORDER SETUP

The DASH II has the ability to permanently save to diskette almost all active recording setups. This ability can be exceptionally useful because it completely eliminates the need for time-consuming, repetitive recorder preparation. Equally important, it allows you to create a "library" of recorder setups so that, whenever necessary, you can easily retrieve and reuse formats that have been previously set up.

When an active recorder setup is saved, the parameters that are saved include:

MENU key settings
SPEED key settings
Grid settings
Data Capture settings
Trigger settings
Data Playback settings
System I/O settings
Data Logger recording mode settings

Setups are saved as a group in a named file. It is convenient to refer to saving all the recorder setups as saving "the setup."

Functions relating to recorder setup files are performed using the Disk I/O menu, accessed with the **MENU** key.

The DASH II's "SAVE SETUP" function is used when you want to save the setup selections of a recording session to diskette. To save the setup:

1 Insert a formatted 3.5-inch diskette into the disk drive. If necessary, use the FORMAT DISK procedure described later in this chapter.

2 Press the front-panel **MENU** key twice to access the second level of the System Setup menu:

3 Press the soft key below DISK I/O to access the menu that controls disk-related functions.

4 Press the soft key below Syst File to assign a name to the setup file and save it to disk.

5 Press the soft key below Save if necessary to activate the save function.

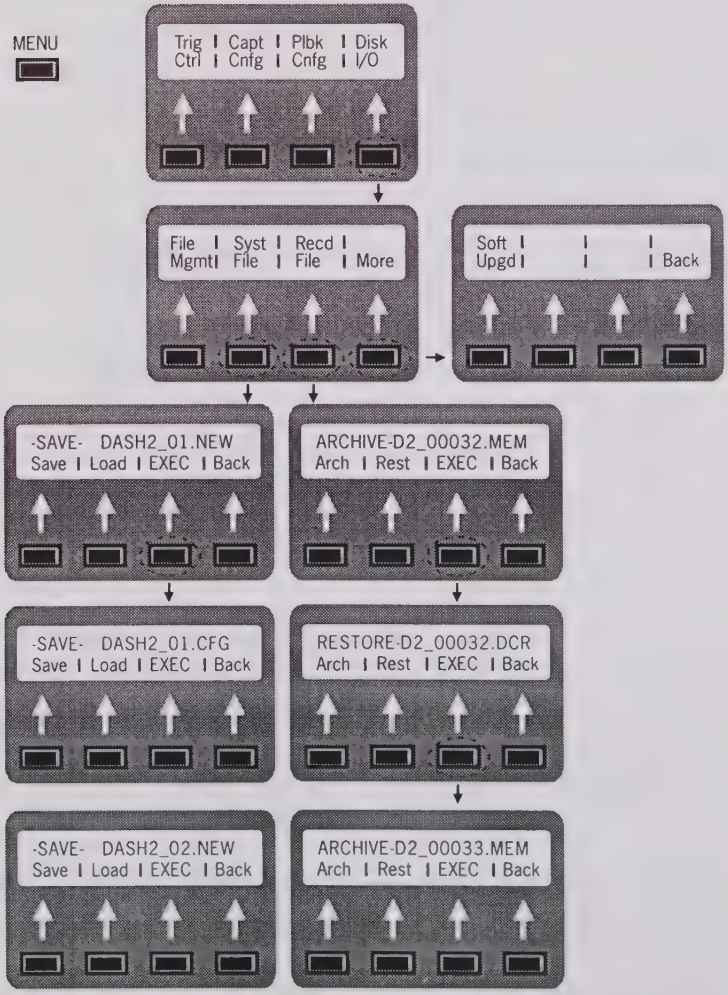
A name in the form "DASH2_*xx*.NEW" (where *xx* represents the file number, beginning with 01) will be assigned to the setup record.

6 Press the soft key below EXEC to begin saving the setup file to disk.

When completed, the file will have the name "DASH2_xx.CFG". To save a new system setup to disk, use the encoder wheel to select the next file called "DASH2_xx.NEW" and repeat the process.

A saved system setup file always has the extension "CFG".

7 Press the soft key below Back to return to the Disk I/O menu.


MENU
Trig Ctrl | Capt Cnfg | Plbk Cnfg | Disk I/O
File Mgmt | Syst File | Recd File | More
Soft Upgd | Back
-SAVE- DASH2_01.NEW
Save | Load | EXEC | Back
ARCHIVE-D2_00032.MEM
Arch | Rest | EXEC | Back
-SAVE- DASH2_01.CFG
Save | Load | EXEC | Back
RESTORE-D2_00032.DCR
Arch | Rest | EXEC | Back
-SAVE- DASH2_02.NEW
Save | Load | EXEC | Back
ARCHIVE-D2_00033.MEM
Arch | Rest | EXEC | Back

RECALLING A RECORDER SETUP

When a saved recorder setup is recalled from diskette, the active recorder setup is lost and cannot be recovered. If you want to retain the active setup, always save it to diskette before recalling the saved setup.

You can recall a setup for the DASH II as follows:

1 Insert the diskette that contains the desired setup file into the disk drive.

2 Press the front-panel **MENU** key twice to access the second level of the System Setup menu.

3 Press the soft key below DISK I/O to access the menu that controls disk-related functions.

4 Press the soft key below Load to activate the restore function.

5 Use the encoder wheel to select the name of the saved recorder setup file that you want to load from the diskette.

6 Press the soft key below EXEC.

The selected recorder setup is recalled from diskette and becomes the active recorder setup.

7 Press the soft key below Back to return to the Disk I/O menu.

SAVING DATA CAPTURE RECORDS

The content of the DASH II data capture memory can be lost if power to the recorder is cycled or if records are overwritten. To preserve captured data, you must save the data capture record(s) to diskette. This section describes saving and recalling data capture records on diskette.

The content of a data-capture record file generally includes information about how the capture was performed and the actual data (signals) stored. This signal data will also include event marker data.

Functions relating to data capture record files are performed from the SETUP CAPTURE function of the System Setup menu.

To save data capture records to diskette:

1 Insert a formatted 3.5-inch diskette into the disk drive. If necessary, use the FORMAT DISK procedure described later in this chapter.

2 Press the front-panel **MENU** key twice to access the second level of the System Setup menu.

3 Press the soft key below DISK I/O to access the menu that controls disk-related functions.

4 Press the soft key below Recd File to access the menu where you can save and restore data capture records to and from disk.

5 Press the soft key below Arch and use the encoder wheel to select the data capture record you wish to save to disk.

The data capture records are assigned names in the form "D2_*xxxxx*.MEM" (where *xxxxx* represents the data capture record file number, beginning with 00001). The extension .MEM always indicates a data capture record that is in system memory.

6 When you have located the record you wish to save to disk, press the soft key below EXEC.

When the process is complete, the data capture record is saved to diskette under the assigned file name, but the extension of the saved record is changed to .DCR. The extension .DCR always indicates a data capture record that is archived to disk.

For example, if you have archived a data capture record called "D2_00032.MEM", you will have one record on disk called "D2_00032.DCR" and the same record in system memory called "D2_00032.MEM". The next time a data capture record is created, the DASH II will give it the name "D2_00033.MEM".

7 Press the soft key below Back to return to the Disk I/O menu.

To retrieve a data capture record from diskette:

1 Insert the diskette that contains the desired data capture record into the disk drive.

2 Press the front-panel **MENU** key twice to access the second level of the System Setup menu.

3 Press the soft key below DISK I/O to access the menu that controls disk-related functions.

4 Press the soft key below Rest to activate the Restore function.

5 Use the encoder wheel to select the name of the data capture record file that you want to restore from the diskette. Notice that only files with the extension .DCR are displayed.

6 Press the soft key below EXEC.

The selected data capture record file is recalled from diskette.

7 Press the soft key below Back to return to the Disk I/O menu.

When the process has completed, the selected record will be restored to data capture memory in the DASH II. However, once in system memory, the file will be assigned the most recent name, with the extension .MEM.

If you want to save the active recorder setup to diskette, do so before performing the system software upgrade. If you do not save the active recorder setup, it will be lost during the upgrade procedure and will not be recoverable.

To upgrade the system software for the DASH II Recorder, perform the following procedures:

1 Press the front-panel **MENU** key twice to access the second level of the System Setup menu.

2 Press the soft key below DISK I/O to access the menu that controls disk-related functions.

3 Press the soft key below More.

4 Press the soft key below Soft Upgd.

The DASH II will display the current version number.

5 If you wish to upgrade to a more recent version, press the soft key below Next to continue with the upgrade procedure.

Make sure that the diskette containing the software upgrade is inserted into the recorder's disk drive.

6 Press the soft key below Begin to proceed with the upgrade procedure.

A display is automatically generated informing you that the erasure phase of the system software upgrade is in progress. The message is dynamic and shows the percentage of the erasure phase that has been completed.

The erasure message is followed automatically by a message informing you that the programming phase of the system software upgrade is in progress. The message is dynamic and shows the percentage of the programming phase that has been completed.

A final message is generated automatically informing you that the upgrade procedure is complete:

UPGRADE COMPLETE
RECYCLE POWER

7 Turn the recorder off and on again to begin operating the recorder with the upgraded system software.

FORMATTING A DISKETTE

The DASH II's disk drive requires the use of 3.5-inch, 1.44Mb, double-sided, high-density (DSHD) diskettes.

To format a diskette:

1 Insert a 3.5-inch diskette into the disk drive.

2 Press the front-panel **MENU** key twice to access the second level of the System Setup menu.

3 Press the soft key below DISK I/O to access the menu that controls disk-related functions.

4 Press the soft key below File Mgmt to access the File Management menu.

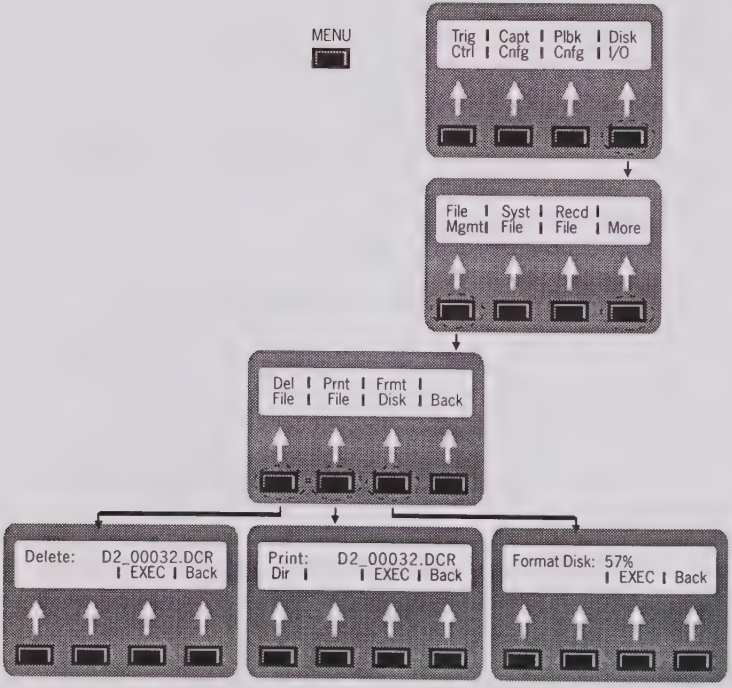
5 Press the soft key below Frmt Disk.

6 Press the soft key below EXEC.

The formatting process will begin and the display dynamically shows the number of tracks formatted.

7 Press the soft key below Back to return to the Disk I/O menu.

WARNING Formatting a disk will erase any existing data on the disk. The data cannot be recovered.



DELETING A FILE FROM DISK

Use the following procedure to delete any file that is saved on a diskette.

1 From the File Management menu, press the soft key below Del File.

2 Use the encoder wheel to select the name of the file that you want to delete.

3 Press the soft key below EXEC.

The selected file will be deleted from the diskette.

PRINTING A FILE FROM DISK

Use the following procedure to print any file that is saved on a diskette.

1 From the File Management menu, press the soft key below Prnt File.

2 Use the encoder wheel to select the name of the file that you want to print on the chart.

3 Press the soft key below EXEC.

The selected file will be printed on the chart.

PRINTING A DOS DIRECTORY OF DISK CONTENTS

If you wish to see a list of the contents of a disk, or to check available disk memory, you can do so from the same Print File screen.

1 Press the soft key below Dir to select the DOS Directory.

2 Press the soft key below EXEC.

The directory will be printed on the chart.

To return to the Disk I/O menu, press the soft key below Back.

System-level Functions

System-level functions include:

- setting the system clock
- setting the DASH II to the default system settings
- reporting
- deleting records from system memory

SETTING THE SYSTEM CLOCK

To set the clock on the DASH II:

1 Press the **MENU** key to access the System Setup menu.

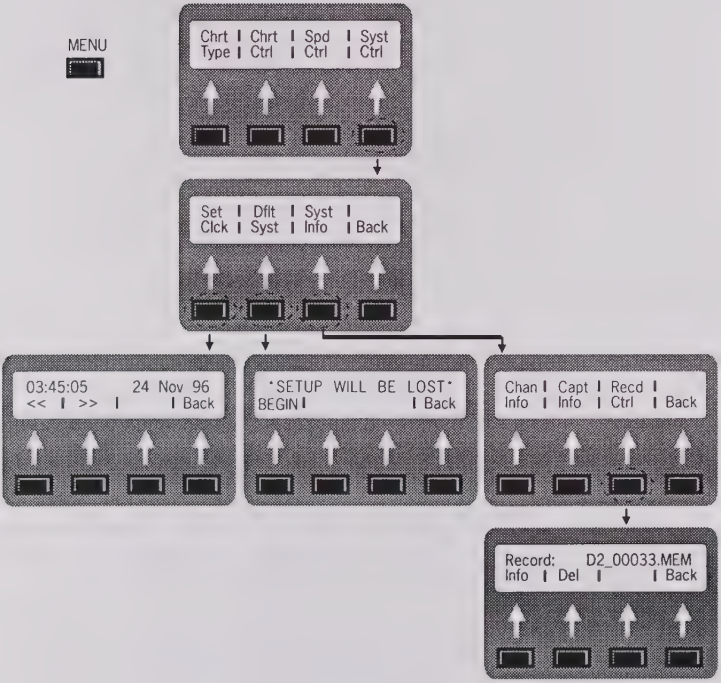
2 Press the soft key below Syst Ctrl to access the menu that controls the system-level functions.

3 Press the soft key below Set Clck.

4 Press the soft keys below << or >> to individually select each parameter of the date and time: day, month, year, hour, minute, second.

5 When each parameter is selected, use the encoder wheel to set the parameter to the value you want.

6 Press the soft key below Back to return to the previous menu.



SETTING SYSTEM DEFAULTS

To restore the system default settings:

1 Press the **MENU** key to access the System Setup menu.

2 Press the soft key below Syst Ctrl to access the menu that controls the system-level functions.

3 Press the soft key below Dflt Syst.

You will be warned that restoring the default settings will cause all current settings to be lost. If you wish to save the current settings to disk, do so before restoring the defaults.

4 Press the soft key below BEGIN to restore the default settings.

5 Press the soft key below Back to return to the previous menu.

SYSTEM REPORTING

You can have immediate access to system information when you need it. The DASH II can instantly print one of the following reports:

- Channel Information provides information on the type of input, range, zero suppression, zero position, and filters for each channel.

- Capture Information provides information about data capture, playback, and archival, as well as triggering setup.

- Record Control provides information about the data capture records currently in system memory, and allows you to delete records from memory.

To print a report:

1 Press the **MENU** key to access the System Setup menu.

2 Press the soft key below Syst Ctrl to access the menu that controls the system-level functions.

3 Press the soft key below Syst Info.

4 Press the soft key below the type of report that you wish to print.

If you chose either Channel Information or Capture Information, the report will be printed immediately.

If you wish to print a Data Capture Record Report about a specific record (Recd Ctrl), another menu will appear. From this menu, you can print a report on a record or delete a record from system memory.

5 Use the encoder wheel to select the record for which you want a report, then press the soft key below Info.

The Data Capture Record report will be printed.

DELETING A DATA CAPTURE RECORD FROM SYSTEM MEMORY

If you wish to delete a data capture record from system memory:

1 Press the **MENU** key to access the System Setup menu.

2 Press the soft key below Syst Ctrl to access the menu that controls the system-level functions.

3 Press the soft key below Syst Info.

4 Press the soft key below Recd Ctrl.

5 Use the encoder wheel to select the record you want to delete.

6 Press the soft key below Del.

7 Press the soft key below Back as necessary to return to the system-level menus.

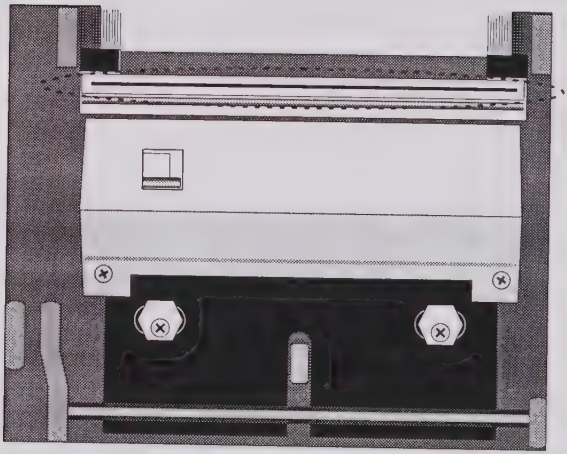
NOTE: To delete a data capture record archived to disk, follow the procedure described in the previous section entitled "Disk and File Management."

6 MAINTENANCE

Routine care and maintenance of the DASH II consists mainly of proper care of the printhead, which should be cleaned regularly, aligned if necessary, and replaced if damaged. Aligning the printhead is generally necessary after replacing the printhead.

CLEANING THE PRINTHEAD

For best performance, the print elements of the thermal printhead must be kept free of any debris or residue build-up. Cleaning the printhead refers to cleaning the hairline row of print elements that can be seen running across the top of the printhead. At a minimum, clean the DASH II's printhead after every ten hours of operation.



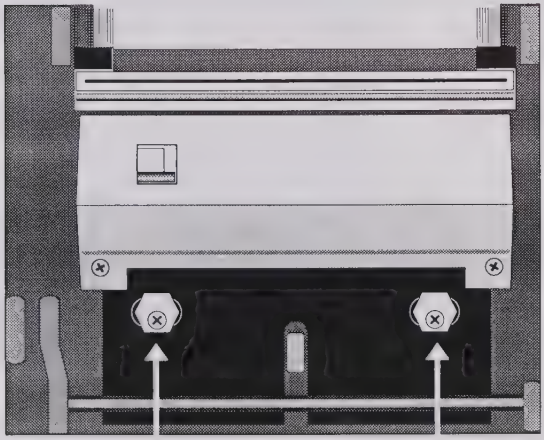
To clean the printhead:

1 Open the paper-chamber door and, on the underside of the door, locate the printhead mounted on the printhead plate assembly.

2 Clean the hairline row of print elements on the printhead with a cotton swab dipped in isopropyl alcohol.

If you find it necessary to replace the printhead, have the following tools ready for use during the printhead replacement procedure:

- #1 Phillips head screwdriver with an overall length of 4" or less
- $\frac{1}{2}$" open-end wrench
- $\frac{3}{16}$" flat-head screwdriver
- a pair of needle-nose pliers

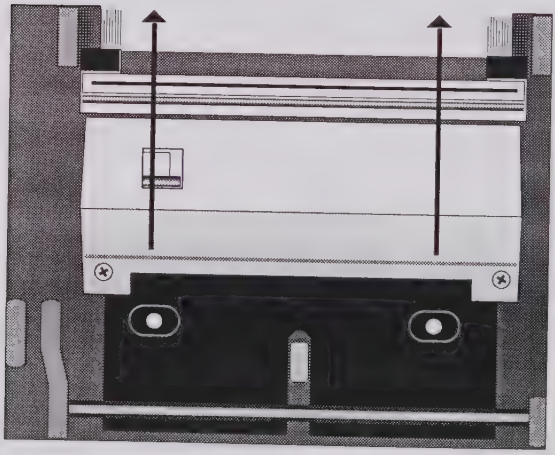


1 Open the paper-chamber door and locate the printhead plate assembly on the underside of the door.

2 Using a #1 Phillips head screwdriver, remove and set aside the two eccentric nuts that secure the printhead plate assembly to the paper-chamber door. The printhead is attached to the printhead plate assembly.

The printhead plate assembly is now held in place by being wedged between the paper-chamber door and the shaft that functions as the hinge of the paper-chamber door.

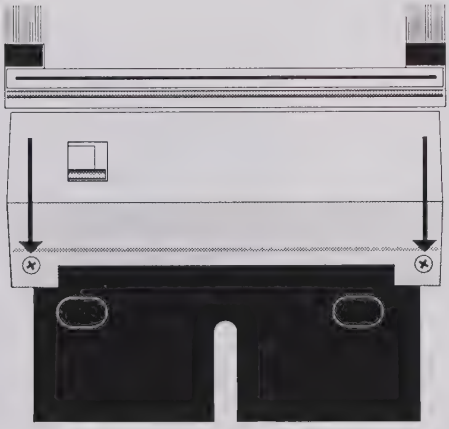
3 Carefully free the printhead plate assembly with attached printhead by sliding the plate up and past the paper-chamber door shaft/hinge.



NOTE: Three springs are located behind the printhead between the printhead plate and the paper-chamber door. When working the printhead plate free, these springs will be released. Ensure that the springs are not lost. When the printhead plate has been freed, remove the springs and set them aside.

4 Completely detach the printhead plate by unplugging the ribbon cable that attaches to the printhead.

5 Remove the two Phillips head screws that attach the paper deflection bracket to the printhead plate assembly.



6 On the rear of the printhead plate assembly, remove the three slot-head screws that attach the printhead to the printhead plate. This will also remove the two printhead anti-static brushes. Set the screws and the static brushes aside.

7 Use a flat-head screwdriver and the three screws that secured the old printhead to attach a new printhead to the printhead plate.

8 Return the printhead plate assembly with attached printhead to the underside of the paper-chamber door and reattach the printhead ribbon cable to the printhead. Ensure that the ribbon cable is fully plugged into the ribbon cable connection.

9 Use a #1 Phillips head screwdriver to re-install the paper deflection bracket on the front of the printhead plate.

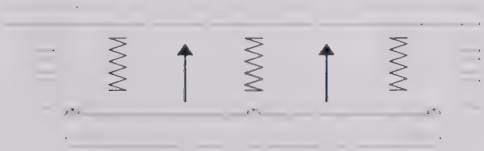
10 Slip the printhead plate assembly between the underside of the paper-chamber door and the shaft that functions as the hinge of the paper-chamber door.

Make sure that the printhead harness sits freely between the two plastic bosses and does not get pinched under the plate.

11 Place the two eccentric nuts and a #1 Phillips head screwdriver next to the recorder within easy handling distance. You will need them nearby immediately after completing step 13.

12 Lower the paper-chamber door as if to close it until the printhead rests against the printhead platen.

Using a needle-nose pliers, carefully re-insert the four springs between the rear of the printhead and the underside of the paper-chamber door. Ensure that the springs are positioned in the holes provided in the rear of the printhead plate assembly and the underside of the door.



13 With the printhead springs in position, grip the printhead and paper-chamber door with one hand and compress the springs to bring the printhead plate and paper-chamber door close together. This requires only a little pressure.

14 Raise the paper-chamber door and, using a #1 Phillips head screwdriver, carefully re-insert the two eccentric nuts in position at the bottom of the printhead plate. Tighten the nuts in place firmly but not with excessive pressure.

This completes the printhead replacement procedure.

NOTE: After this printhead replacement procedure has been completed, the printhead print elements may need to be horizontally aligned with the printhead platen. The printhead alignment procedure is described in the next section, "Aligning the Printhead."

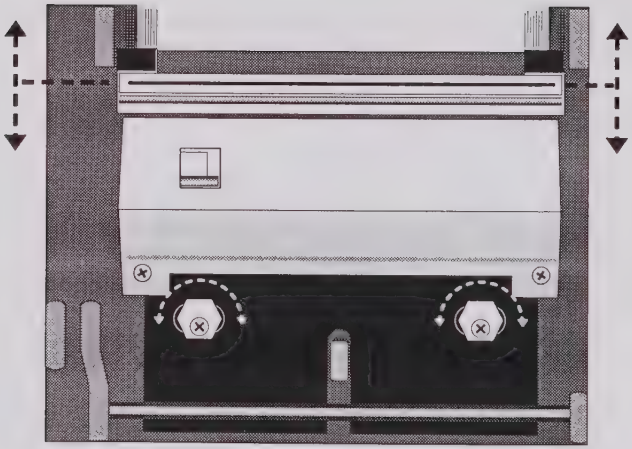
Before leaving the factory, your DASH II was adjusted to provide optimum print quality.

For best printing quality, the active area of the printhead should be positioned at the crest of the printing platen. The active area of the printhead is actually a hairline-thin horizontal row of individual print element dots that run the length of the printhead.

Aligning the horizontal position of the printhead consists of nothing more than moving the printhead back or forth as necessary to get the print elements directly over the surface of the printhead platen.

The eccentric nuts just below the paper deflection bracket are used to adjust the horizontal alignment of the print elements. As each eccentric nut is rotated clockwise, the nut moves the end of the printhead in a relative "up" direction. As each eccentric nut is rotated counterclockwise, the nut moves the end of the printhead in a relative "down" direction.

Refer to the illustration on the next page.



Use a $\frac{1}{2}$" open-end wrench to adjust each eccentric nut to bring the printhead into horizontal alignment with the printhead platen.

Rotate one of the nuts clockwise to move that end of the printhead in a relative "up" direction.

Rotate one of the nuts counterclockwise to move that end of the printhead in a relative "down" direction.

The printing elements should be positioned at the crest of the platen.

Battery Type: NICAD (Astro-Med part number 23520-001)

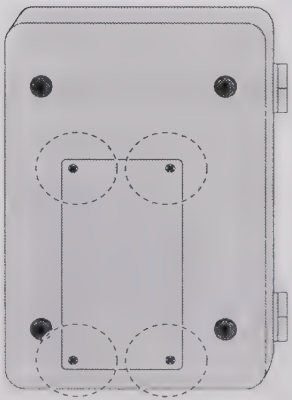
CAUTION **DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED**

Replace the battery with the same or equivalent type, as recommended by the manufacturer. Dispose of the used battery according to the manufacturer's instructions.

1 Turn off and unplug the DASH II recorder.

2 Place the recorder in a position where you will have access to the bottom of the recorder.

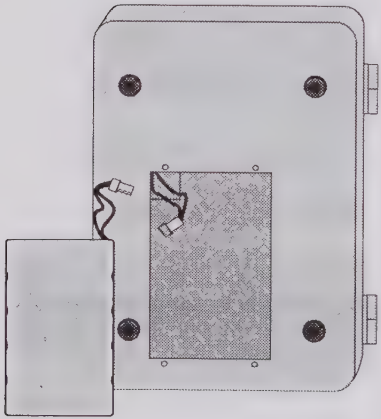
3 Using a #1 Phillips head screwdriver, remove and set aside the four screws that secure the battery retaining plate.



4 Remove the battery from the open compartment.

5 Unplug the connector that attaches the battery to an internal harness and set the used battery aside.

6 Plug the new battery pack (Astro-Med part # 23520-001) into the battery connector.



7 Place the connected battery pack into the battery compartment.

8 Position the battery cover plate over the battery pack and secure the plate with the four screws removed in step 3.

This completes the procedure for replacing the battery pack.

Battery Type: LITHIUM (Eagle-Picher Model LTC-16P-CO-F-57)

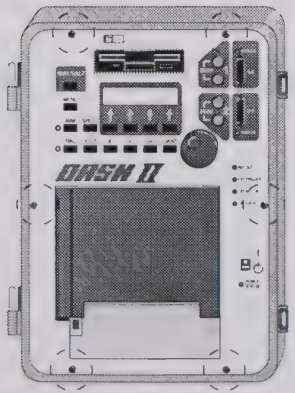
This battery, located on the CPU board inside the DASH II, ensures that system settings are saved.

CAUTION **DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED**

Replace the battery with the same or equivalent type, as recommended by the manufacturer. Dispose of the used battery according to the manufacturer's instructions.

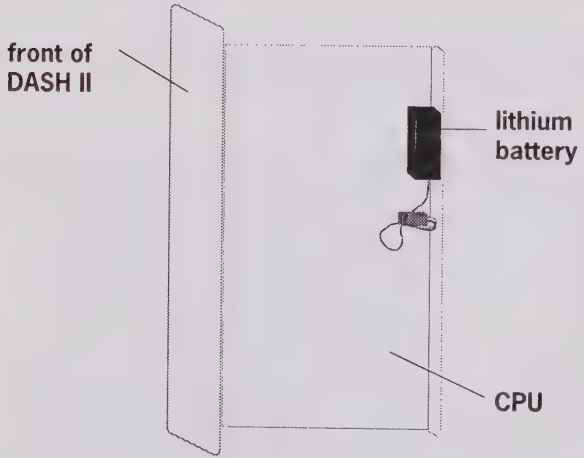
1 Turn off and unplug the DASH II recorder.

2 Using a #1 Phillips head screwdriver, remove and set aside the six screws that secure the DASH II to its case.



3 Gently remove the DASH II from its case.

4 On the upper right side of the DASH II's CPU board, locate the Lithium battery.



5 Unplug the small harness attached to the battery, and remove the battery. It is attached to the DASH II by a velcro strip.

6 Plug in the small harness attached to the new battery, and attach the battery to the DASH II.

7 Place the DASH II into its case and replace the six screws removed in step 2 that secure the DASH II to its case.

This completes the battery replacement procedure.

A DASH II Specifications

Isolated 2- Channel Voltage-Input Unit

Input method:	Isolated, single-ended
Input terminal:	Banana plug
Input coupling:	DC
Input impedance:	1 MΩ
Measuring range:	
mV range:	50 mV to 3500 mV
V range:	3.5 V to 350 V (DC or AC P.P.)
Accuracy:	< ± 0.5 % of full-scale
Maximum allowable input:	250 V RMS
Input/output isolation:	1500 V RMS
CMR (IMR):	> 80 dB
Zero suppression:	
mV range:	± 5000 mV, 2.5-mV step
V range:	± 250 V, 0.25-V step
ZS accuracy:	± 1 step
Zero position:	± 50 % (0 to 100% of recording width), with ≤.1 %/ step

2-Channel Non-Isolated DC Bridge/High-Gain Amplifier Unit

Input method:	differential, balanced to common
Input terminal:	15-pin D-shell
Input coupling:	DC
Input impedance:	6 MΩ.
Measuring range:	5 mV to 300 mV (DC or AC P.P.)
Accuracy:	< ± 1.5 % of full-scale
Maximum CMV:	± 10 V DC or AC
Input/output isolation:	None
CMR:	> 90 dB
Transducer excitation voltage:	0 to 10 V DC, at 0.25-V step
Excitation voltage accuracy:	± 1 step
Transducer balance method:	automatic (right, left or center of the recording width), or manual (coarse & fine adj.)
Zero Balance accuracy	
Auto mode:	< ± 1 %
Manual mode:	< ± 0.1 %

DSP Functions

FILTER:

Low pass (@-3 ±0.5 dB):	1, 2, 5, 10, 20, 40, 50, 100, 200, 500 Hz
Notch:	50 and 60 Hz
RMS averaging time:	selectable (slow, medium, fast)

DRIFT:

Temperature	
Gain:	± 0.05% FS/°C
Zero:	± 0.1% FS/°C
Time	
Zero baseline:	± 0.5% FS in <10 min (cold start) ± 0.1% FS / 24 hr.

CHART SPEED:

Internal clock:	1 mm/min to 125 mm/s
External clock:	up to 25 mm/s
External motor:	START / STOP

CHART TYPE:

2-grid, 40 or 50 mm;
1-grid, 100mm

RECORDING PAPER:

150-foot roll

TRIGGER:

internal, external,
& front-panel manual

POWER CONSUMPTION:

Maximum AC input current:	~2 amp. @ 120 VAC

OPERATING POWER:

External AC:	90-130 V, 190-260 V
External DC:	10-20 V
Internal:	optional 12-V battery
Battery life:	>1 hour nominal
Charge time:	<15 hours

OPERATING ENVIRONMENT:

Temperature:	5 to 40°C
Humidity:	25 ~ 85% RH

STORAGE TEMPERATURE:

0 ~ 80°C (non-condensed)

DIMENSIONS IN INCHES:

without cover:	H: 6.37 x L:15.25 x W: 10.73
with cover:	H: 8.37 x L:15.25 x W: 10.73

WEIGHT:

<24 lb., including battery

B DASH II Wiring Diagrams

Each of the two channels can be configured for one of two types of signal input:

- isolated DC-coupled voltage input
- non-isolated DC bridge input

Each input type uses a separate connector. An isolated DC-coupled voltage input uses a pair of guarded banana inputs. A non-isolated DC bridge input uses a multi-signal terminal block. A dedicated LED indicator, labeled "BRIDGE," illuminates when DC bridge input is active.

The non-isolated bridge circuitry allows resistance bridges to be used for signal inputs. Typical wiring diagrams for the various types of bridge applications are presented in this appendix.

Isolated 2-Channel DC Voltage Amplifier

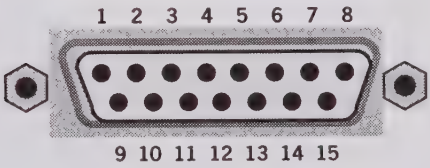
The isolated DC Voltage Amplifier is an isolated, single-ended voltage amplifier that has a guarded banana plug connector:

RED Isolated Signal

BLACK Isolated Common

Non-Isolated DC Bridge/High-Gain Amplifier

The non-isolated DC Bridge/High-Gain Amplifier is a differential, high-input-impedance amplifier, balanced to common. The amplifier can be used for measuring low-level signals ranging from 5 mV full scale to 300 mV full scale. Such a signal can be measured from direct voltage sources or from bridge-based transducers. The 15-pin D-shell connector is used both as a signal input and a power (transducer excitation) output.



HIGH-GAIN AMPLIFIER MODULE

The wiring configuration for the High-Gain Amplifier Module is as follows:

Pin Number	Function
9	Signal (+)
2	Signal (-)
6	Common

DC BRIDGE AMPLIFIER MODULE

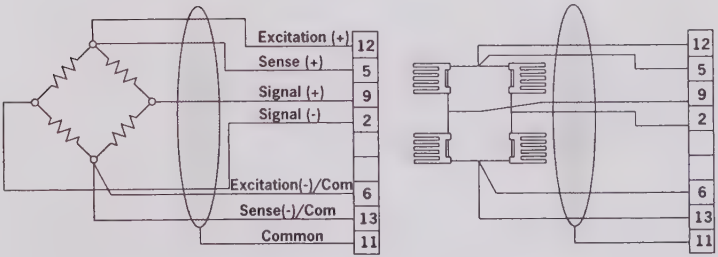
The wiring configuration for the DC Bridge Amplifier Module is as follows:

PIN NUMBER	FUNCTION
1	——
2	Signal (-)
3	——
4,2 *	$^1/_4$ & $^1/_2$ bridge completion
5	Sense (+)
6	Excitation (-)/ground
7	——
8,6 *	$^1/_4$ & $^1/_2$ bridge completion
9	Signal (+)
10	——
11,9	Ground/$^1/_4$ bridge completion
12	Excitation (+)
13	Sense (-)
14	——
15	——

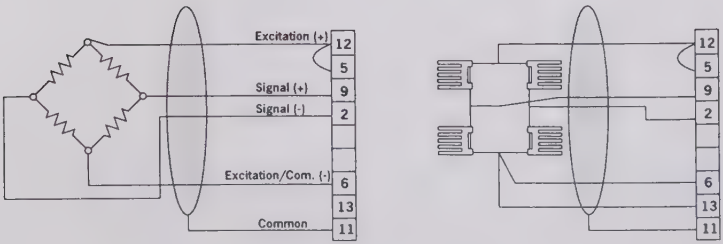
IMPORTANT

* For bridge applications, external completion resistors are required. Such resistors can be mounted/soldered on the pins of a transducer-recorder interfacing D-shell connector.

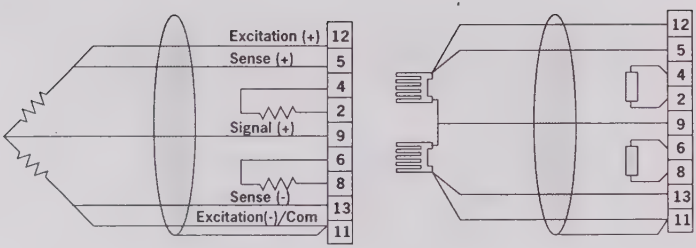
IMPORTANT In 4-wire full-bridge, 3-wire half-bridge, or 2-wire quarter-bridge applications, it is recommended that the Sense(+) lead be jumped to the Excitation(+) to prevent drift in the output of the transducer power supply.



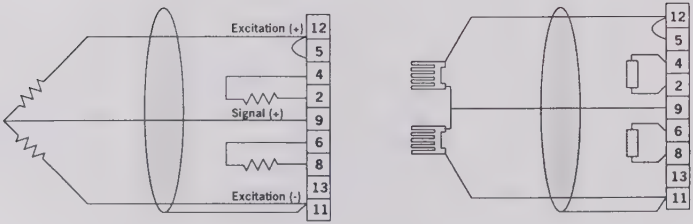
Typical 6-Wire Full Bridge



Typical 4-Wire Full Bridge

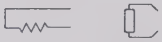


Typical 5-Wire Half Bridge

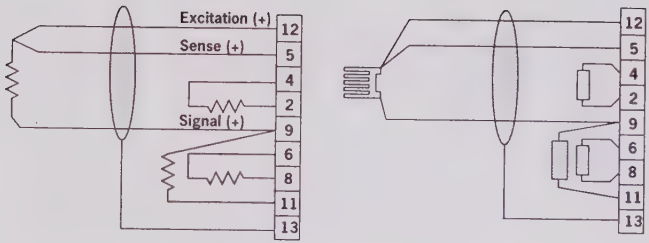


Typical 3-Wire Half Bridge

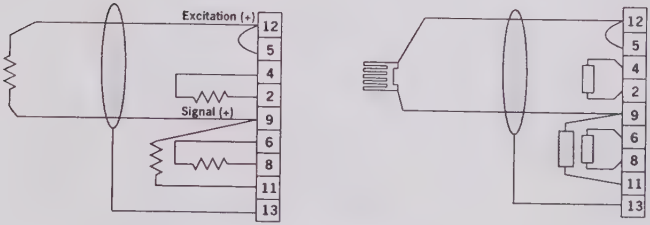
NOTE



represent external bridge completion resistors

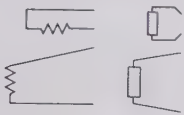


Typical 3-Wire Quarter Bridge



Typical 2-Wire Quarter Bridge

NOTE



represent external bridge completion resistors

C DASH II Auxiliary Input/Output

Three subminiature (mini) phone jacks are provided for use by input/output signals as follows:

EXTERNAL EVENT INPUT

The External Event input is a TTL-level input that controls the state of the system event signal on the chart. The input is sampled at 8 MHz, allowing events as small as 500 nanoseconds to be detected. The input is also polled at 10 kHz for inclusion in data capture records, regardless of the currently established data capture rate.

When a correctly wired mini phone plug is inserted into the EXT EVENT mini phone jack, an external TTL low or a switch closure will cause the external event marker to deflect to the left. The marker returns to its undeflected position when these signals are no longer sensed.

To use the EXT EVENT marker, follow the procedure below:

1 Wire one of the mini phone plugs supplied with your DASH II to your external signal.

2 Insert the phone plug into the front-panel EXT EVENT phone jack.

3 Apply a TTL low or a switch closure to deflect the external event marker to the left to mark the location of data of interest.

EXTERNAL MOTOR INPUT

The external motor input is a TTL-level input that can be configured to control the motor in one of two ways.

- It can be polled by the main CPU to be used as an external motor start/stop input. When active, the CPU stops the motor if the signal is polled high (its default condition), and starts the motor when asserted low by an external device.

- This signal can also be used as an external motor clock source. This function allows you to input a pulse train generated from an external clock source to control the recorder's print rate and stepper motor.

  As a remote motor clock input, it can drive the unit up to 25 mm/sec at a maximum of 300 Hertz.

To use the EXT MOTOR jack as an input for remote stop/start, follow the procedure below:

1 Wire one of the mini phone plugs supplied with your DASH II.

2 Insert the phone plug into the front-panel EXT MOTOR phone jack.

3 When the recorder receives a switch closure, the chart will be halted. A switch open will cause the chart to resume running.

To use the EXT MOTOR jack for motor control, follow the procedure below:

1 Wire one of the mini phone plugs supplied with your DASH II to your external clock source.

2 Insert the phone plug into the front-panel EXT MOTOR phone jack.

3 When the phone plug is inserted into the EXT MOTOR jack the recorder's print rate and stepper motor will be controlled by the pulse train supplied by your external clock source.

EXTERNAL TRIGGER

The External Trigger is a TTL-level signal that can be configured as a trigger input (active low) or trigger status output (active low). This signal allows other instruments or devices to trigger a data capture or it can trigger other instruments.

To use the EXT TRIGGER marker, follow the procedure below:

1 Wire one of the mini phone plugs supplied with your DASH II to your external trigger source.

2 Insert the phone plug into the front-panel EXT TRIGGER mini phone jack.

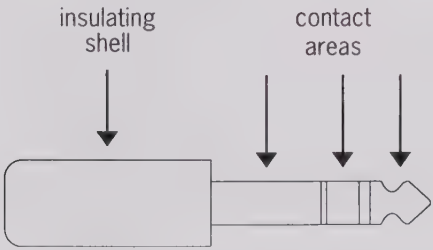
3 Apply a TTL low in for a trigger input from an external instrument or device to trigger a data capture. Apply a TTL low out for trigger output to trigger another instrument.

WARNING As an output, it is not open-collector. Therefore, multiple outputs should not be OR-tied or damage to the circuitry could result.

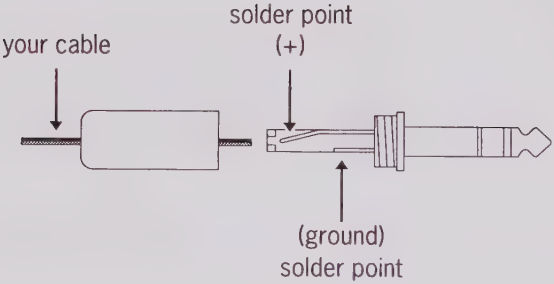
Three subminiature (mini) phone plugs are supplied with the DASH II. These phone plugs are used with recorder's EXT MOTOR, EXT TRIGGER, and EXT EVENT front-panel mini phone jacks.

The phone plugs are identical and are identically wired. Use the procedure below to wire each of the phone plugs.

1 Unscrew the metal plug from its plastic insulating shell.



2 Run your cable through the plastic insulating shell and solder it as illustrated in the following drawing.



3 Screw the plastic insulating shell back onto the metal plug.

D

DATA CAPTURE RECORD FORMAT

This appendix details the content and format of the DASH II data capture record file format, as used when saving to or restoring from disk. In most cases, if these files are simply saved and later recalled to the recorder, you need not know their content. The information in this appendix is necessary only in cases where a programmer wishes to create or interface to these files.

Astro-Med reserves the right to expand the size and content of data capture record files, as dictated by the recorder's capabilities. Therefore, it is recommended that programs written to interface with this file format be written to handle special data, such as versions and data counts, to keep upward compatibility.

The content of the file generally includes information about the actual data (signals) stored and about how the data capture was performed. This signal data will also include event marker data.

DASH II Data Capture Record File Format

address	byte(s)	data items	description
0000-0007	8	8 char	File ID (contains 'DASH II ')
0008-0011	4	1 word	Version of data capture record (DCR) format
0012-0015	4	1 word	Size of Record Information section

RECORD INFORMATION SECTION

address	byte(s)	data items	description	
0016-0027	12	12 char.	Record name 'FILENAME.DCR'	
0028-0035	8	2 words	Trigger time	
0036-0039	4	1 word	Record size	
0040-0043	4	1 word	Record status	
0044-0047	4	1 word	Trigger location	
0048-0051	4	1 word	Capture rate	
0052-0055	4	1 word	Capture rate range	
0056-0063	8	2 words	Channel type (x 2)	
0064-0071	8	2 words	Conditioning - ground status (x2)	
0072-0079	8	2 words	Conditioning - DC range (x2)	
0080-0087	8	2 words	Conditioning - DC gain (x2)	
0088-0095	8	2 words	Conditioning - DC zero suppression (x2)	
0096-0103	8	2 words	Conditioning - DC zero position (x2)	
0104-0111	8	2 words	Conditioning - bridge gain (x2)	
0112-0119	8	2 words	Conditioning - bridge zero suppression (x2)	
0120-0127	8	2 words	Conditioning - bridge zero position (x2)	
0128-0135	8	2 words	Conditioning - bridge excitation (x2)	
0136-0143	8	2 words	Conditioning - DSP mode (x2)	
0144-0151	8	2 words	Conditioning - filter type (x2)	
0152-0159	8	2 words	Conditioning - filter rate (x2)	
0160-0167	8	2 words	Conditioning - RMS rate (x2)	
0168-0175	8	2 words	User scaling - status (x2)	not currently implemented
0176-0183	8	2 words	User scaling - units (x2)	
0184-0191	8	2 words	User scaling - factor (x2)	
0192-0199	8	2 words	User scaling - offset (x2)	
0200-0207	8	2 words	User scaling - precision (x2)	

WAVEFORM STORAGE INFORMATION

address (decimal)	byte(s)	data items	description
See note 1.	See note 1.	See note 1.	Waveform data (beginning)

Note 1: Waveform data begins at:

Address 16 (decimal) + Size of record information

Waveform data is stored in the file in repeating sets of 16-bit data items, with the high byte preceding the low byte (high-byte/low-byte format). Sets represent Channel 1 and Channel 2.

Note 2: We intend the first 16 bytes of the format to remain fixed. Subsequent bytes may change in later software versions.

WAVEFORM SIGNAL DATA (16 BITS WIDE)

bits	data
0 - 11	12-bit unsigned waveform (signal) data
12	0 (currently unused)
13	trigger: 0 = pre-trigger; 1 = post-trigger
14	external event status: 0 = low; 1 = high
15	channel #: 0 = channel 1; 1 = channel 2

NOTE: 1 data word = 4 bytes
1 character = 1 byte
1 float = a 4-byte (32-bit) IEEE-754 floating point number

FILE ID Eight characters representing a fixed identification ('DASH-II') symbolic of a valid file.

VERSION One data word representing the unique file format version.
Valid: 1 decimal represents version 1.0.
2 decimal represents version 1.1.

SIZE OF RECORD INFORMATION One data word, representing the offset to the waveform data portion of the disk file. This word represents the number of bytes before the waveform data begins.

RECORD NAME Twelve (12) characters representing a DOS filename: 'FILENAME.EXT'.

TRIGGER TIME Eight (8) data bytes (2 words) representing the time and date information.

byte	description	valid data
1	seconds	0-59
2	minutes	0-59
3	hours	0-23
4	day	1-31
5	month	0-11
6	year	0-99
7	reserved	——
8	reserved	——

RECORD SIZE One word representing the number of samples per channel captured.

There is a total of 1 Mb of data capture memory. Two channels are always captured. The number of records held in memory depends on the selected record size. The following table shows various record sizes in kilosamples and kilobytes. Any combination of record sizes is allowed, as long as the total number of bytes does not exceed the 1-Mb limit.

record size (samples)	record size (bytes)	maximum # of stacked records
1 ks	4 kb	100
2 ks	8 kb	100
4 ks	16 kb	64
8 ks	32 kb	32
16 ks	64 kb	16
32 ks	128 kb	8
64 ks	256 kb	4
128 ks	512 kb	2
256 ks	1 Mb	1

RECORD STATUS One word representing the data capture status:
0 = no record
1 = pre-trigger abort
2 = post-trigger abort
3 = full capture

TRIGGER LOCATION One data word representing how far into the record the trigger occurs. This is only valid if the data capture was not aborted during the pre-trigger phase.

CAPTURE RATE One data word defining the timebase of the data capture. This value in conjunction with the Capture Rate Range denotes the capture rate per sample (for example, 100 µsec/sample).

CAPTURE RATE RANGE One data word defining the data capture time range:
0 = seconds
1 = milliseconds
2 = microseconds

SIGNAL CONDITIONER DATA DEFINITIONS

Channel Type	0, 1	0 = DC; 1 = bridge
Ground Status	0, 1	0 = full scale; 1 = grounded
DC Range	0, 1	0 = 50 mV to 3490 mV; 1 = 3.5 V to 350 V
DC Gain	50 mV to 3490 mV 3.5 V to 350.0 V	
DC Zero Suppression	0 - 4095 2048 = 0 V	±250 volts, volt range ±5 volts, millivolt range step = .25 V if range = V step = 2.5 mV if range = mV
DC Zero Position	0 - 4095	2048 = center of grid 1500 dots = full scale
Bridge Gain	5.0 mV to 300.0 mV	
Bridge Zero Suppression	0 - 4095 2048 = 0 V	±250 volts, volt range ±5 volts, millivolt range step = .25 V if range = V step = 2.5 mV if range = mV
Bridge Zero Position	0 - 4095	2048 = center of grid 1500 dots = full scale
DSP Mode	0, 1, 2	0 = off; 1 = filter; 2 = RMS
Filter Type	0, 1	0 = low-pass; 1 = notch
Filter Rate	1 to 500 Hz 50 Hz, 60 Hz	low pass: up to 500 Hz in increments of 1, 2, or 5 notch: 50 and 60 Hz
RMS Rate	0, 1, 2	0 = slow; 1 = medium; 2 = fast

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